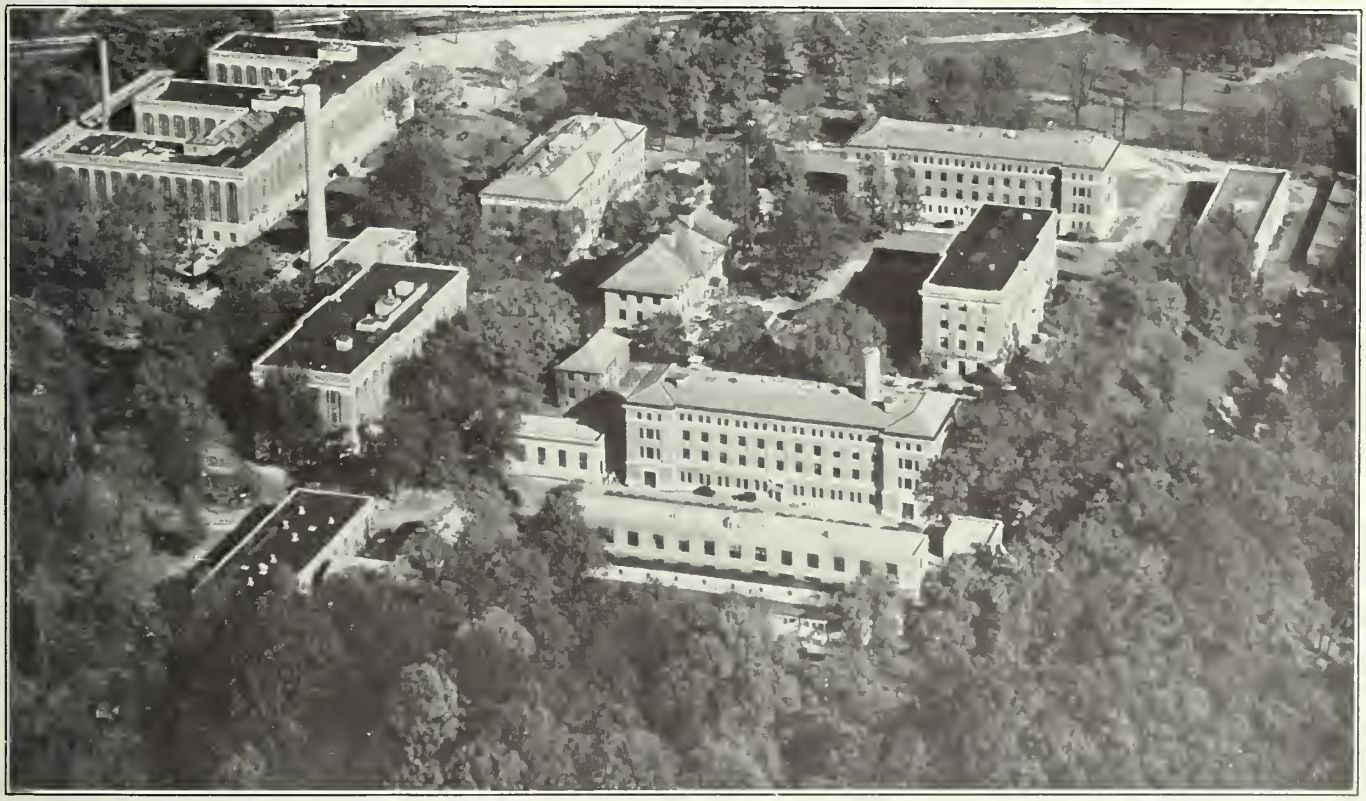
COMMERCIAL STANDARDS MONTHLY

A Review of Progress in Commercial Standardization and Simplification



AIRPLANE VIEW OF NATIONAL BUREAU OF STANDARDS

ISSUED BY THE NATIONAL BUREAU OF STANDARDS OF THE UNITED STATES DEPARTMENT OF COMMERCE, WASHINGTON, D.C., U.S.A.

Vol. 6, No. 12 JUNE, 1930

For sale by the Superintendent of Documents, Washington, D. C. - - - See page 3 of cover for prices

U. S. DEPARTMENT OF COMMERCE

R. P. LAMONT, Secretary

NATIONAL BUREAU OF STANDARDS

GEORGE K. BURGESS, Director

COMMERCIAL STANDARDS MONTHLY

S. F. TILLMAN, Editor

DIVISIONS OF THE COMMERCIAL STANDARDIZATION GROUP

DIVISION OF SIMPLIFIED PRACTICE, EDWIN W. ELY.

The division of simplified practice was formed in November, 1921, to provide a clearing house or centralizing agency through which the manufacturer, distributor, and consumer groups could meet to discuss their common problems and decide upon eliminations which would prove of mutual benefit to all concerned. The activities of the division are purely cooperative in character. It orders nothing; it dictates nothing; the initiative must come from business itself. It has no regulatory nor police powers to enforce adherence to the simplified-practice recommendations that industry develops under the auspices of the United States Department of Commerce. Its chief function is to serve as a neutral meeting ground for the purpose of bringing together producers, distributors, and consumers, whose aims are sometimes divergent and possibly antagonistic, and who would be unwilling to cooperate, except through some unbiased central agency. Following the approval of the tentative simplified-practice recommendation by a general conference of all interested elements thereof, the project is then presented to the entire industry by letter referendum for its approval and written acceptance, the publication and indorsement of the recommendation on the part of the Department of Commerce being dependent upon acceptance of the program by at least 80 per cent, by volume, of the manufacturers, distributors, and users concerned.

BUILDING AND HOUSING DIVISION, J. S. TAYLOR.

The division of building and housing cooperates with business, technical, and professional groups in practically all its undertakings on building and housing. Its work to modernize building codes and to encourage improved standards for the quality of building construction promotes the practical application of the latest development in design and use of building materials. This division was also formed in 1921.

In furthering home ownership, an effort is made to develop an enlarged, steadier, more intelligent, and more discriminating demand for soundly built dwellings, the largest single class of buildings which the construction industries provide. The division also cooperates with many business and professional groups in efforts to distribute building activity more evenly throughout the year, and to secure less fluctuation from year to year. The work on city planning and zoning has in mind the broad objective of buildings made more useful because well located with respect to other buildings, a well-coordinated street system, and appropriate public works. Good city planning and zoning likewise encourages stability in land values and property uses, and thereby contributes to the demand for durable structures.

DIVISION OF SPECIFICATIONS, A. S. MCALLISTER.

The duties of the division of specifications are to promote and facilitate the use and unification of specifications. In doing so it carries on activities involving cooperation with technical societies; trade associations; Federal, State, and municipal Government specifications making and using agencies; producers, distributors, and consumers; and testing and research laboratories. The cooperation with technical societies and trade associations includes ascertaining the standardization and specification promoting activities of these organizations, and bringing to their attention the work being done by the commercial standardization group. The cooperation with governmental agencies and other consumers includes the bringing of Federal specifications and commercial standards to the attention of the maximum number of producers and the maximum number of users of commodities complying with these specifications and standards, thereby assisting in broadening the field of supply. The cooperation with producers involves the compilation and distribution of lists of manufacturers who have expressed their willingness to certify to purchasers, upon request, that material supplied by them on contracts based on certain Federal specifications or commercial standards comply with the requirements thereof. The cooperation with distributors involves bringing to their attention the benefits to be derived by them as both buyers and sellers from handling nationally specified, certified, and labeled commodities. The division prepares the directories of governmental and nongovernmental testing laboratories; the Directory of Specifications; and is working on an encyclopedia of specifications, the first volume of which, Standards and Specifications in the Wood-Using Industries, has been issued. It also aids in preparing the Standards Yearbook.

DIVISION OF TRADE STANDARDS, I. J. FAIRCHILD.

The commercial standards unit, now known as division of trade standards, was created on October 1, 1927, for the purpose of aiding those industrial and commercial groups desiring to establish standards of grades, quality, or measurements for their products or their purchases on a purely voluntary basis.

The division functions only at the direct request of the industry concerned. Its procedure is similar to that of the division of simplified practice, except that at least 65 per cent of the industry, by volume of annual production, must accept the commercial standard in writing before it is published by the Department of Commerce. A certification plan is applied on request as a means of increasing the effectiveness of such standards. Provision is made for regular revision of the standard through the appointment of a standing committee to consider periodically any necessity for revision of the standard, in order that it may be kept constantly compatible with progress in the industry.

Except where otherwise indicated, for further information address

BUREAU OF STANDARDS

WASHINGTON, D. C.

COMMERCIAL STANDARDS MONTHLY

A Review of Progress in
Commercial Standardization and Simplification

VOLUME 6 WASHINGTON, D. C., JUNE, 1930 NUMBER 12

CONTENTS

FEATURE ARTICLES

	Page
Materials used in the electrical industry	375
Railroads make wide use of standardization	377
Sequence of events leading to the adoption of a Federal specification	360
Some standardization research affecting land, sea, and air transportation	373
Standard color for machine tools	361
Standardization in sport	362
Standardization in the manufacture of ordnance material	357
Standardization urgently needed in printing industry	366
Standard time zones	370
The national hydraulic laboratory	367
What is writing ink?	371

SIMPLIFIED PRACTICE NEWS

Masonry opening sizes	378
Propose simplification for terry towels	376

STANDARDIZATION NEWS

Annular ball bearings	365
A. S. T. M. conducting research on cotton	372
A. S. T. M. organizes subcommittees on hollow building units	365
Coordination of marine-boiler rules	366
Current activities of the American Standards Association	381
International cooperation on standards for petroleum products	386
National engineering inspection association formed	366

STANDARDIZATION NEWS—Continued

	Page
Progress in the introduction of American lumber standards	385
Progress in safeguarding industrial workers from accidents	374
Safety code for automobile brakes	384
Standard for grooved trolley wire for mine service	369
Standardization briefs	379
Standards for refinery equipment	359
Standards of design for concrete	360
Sodium oxalate as volumetric standard	359
Specifications for "mattress lumber" drafted	359
Specifications for steel	378
Tapered shaft ends	360
Zoning laws in effect in 46 States	386

TRADE STANDARDS NEWS

Boys' blouses, button-on-waists, shirts, and junior shirts	361
Foundry patterns of wood	382
Proposed standardization of colors for sanitary ware	383
The commercial standards service and its value to business	382

RESEARCH NEWS

New material called maizolith made from cornstalks	383
Paper bags as shipping containers	386
Publication on bismuth	376

FOREIGN NEWS

British standards for switch gear	369
Indian railway standards	372
Standardization of agricultural equipment in Sweden	385
Standard paper sizes have been adopted abroad	384

AN INVITATION TO VISIT THE BUREAU OF STANDARDS

An interesting fact in the growth of the bureau is the steady increase in the number of visitors. From all over the world experts come to see the work in progress in many specialties. Not alone the experts but in growing numbers many of our people visit the bureau from a public-spirited desire to acquaint themselves with its research work. All visitors, from the newspapermen, who have called the bureau a "house of wonders," to the specialists, who use its services, are welcome, for it is their bureau in a very real sense. They are the owners of the business and its beneficiaries. The annual per capita cost of 2 cents which the average citizen pays toward the operation of the bureau yields returns sometimes a hundredfold or a thousandfold. How science turns wastes into profits, increases the useful life of materials, adds new efficiencies to industry, advances new arts, such as aviation and radio, by research and discovery—these are to be seen first-hand in the scientific and technical laboratories of the bureau.

A cordial invitation is extended to all citizens interested in scientific progress to visit the laboratories of the Bureau of Standards when in Washington. A personally conducted trip is organized at 2.15 p. m. daily except on holidays. Special trips for groups may be arranged at other times by writing to the bureau in advance. The bureau's illustrated Visitor's Manual may be had for the asking. This lists the work in progress and gives an airplane view of the ensemble and a brief statement of typical discoveries and inventions which have been notable, basic contributions to radio, aviation, and other modern arts and industries.

GEORGE K. BURGESS, *Director.*

116489—30——1

National Standardizing Bodies in 21 Countries

Such bodies initiate action only when requested to do so by those concerned

IN CARRYING on their standardizing activities the national standards committees or associations in the 21 countries in which such organizations are now functioning follow, with more or less modification, the method of cooperation developed by the first standardizing body created—the British.

The national body does not initiate standardization, but acts only if, and when, it finds that the groups concerned are desirous of having the work undertaken. In fact, it is only on the request of a representative technical or trade organization, or a Government department, that the association acts, and, even then, before appointing a committee to study any subject it authorizes the holding of a representative conference of all concerned in order to be certain that there is a consensus of opinion favorable to such work being carried out, and that it is to fulfill a recognized want. The matter is fully ventilated at such a conference, and it is on its report, if favorable, that the association takes definite action by the appointment of what is called a sectional or departmental committee. The sectional committee in some cases represents a whole industry; at other times it is representative of materials.

The national bodies keep in touch with each other by correspondence, exchanging information in regard to new projects, draft standards, and general tendencies in the national work in the respective countries. The information interchanged is arranged in regular form on uniform blanks, all by agreement between the officers of the various bodies. All approved standards are interchanged as a matter of routine, and each national standardizing body acts as a sales agent for the approved standards of the other bodies.

In the order of their organization the national bodies are as follows: Great Britain, 1901; Holland, 1916; Germany, 1917; United States of America, 1918; Switzerland, 1918; France, 1918 (reorganized in 1928); Belgium, 1919; Canada, 1919; Austria, 1920; Italy, 1921; Japan, 1921; Hungary, 1921; Australia, 1922 (reorganized in 1929); Sweden, 1922; Czechoslovakia, 1922; Norway, 1923; Poland, 1924; Finland, 1924; Russia, 1925; Denmark, 1926; and Rumania, 1928.

STANDARDIZATION IN THE MANUFACTURE OF ORDNANCE MATERIAL

Army Standardizes Its Manufactures Whenever Possible to Simplify Procedure and Permit Maximum Production

By Brig. Gen. C. L'H. Ruggles, *Ordnance Department, U. S. Army*

The Ordnance Department of the Army is charged with responsibility for the procurement of military equipment, including cannon, small arms, and ammunition, required for use by the Military Establishment. Procurement in a broad sense covers the acquisition of finished products, not only by purchase, but by manufacture as well, and, as applied to the field of manufacture, it embraces all the steps preparatory and subsequent to actual production work, such as research, design, factory planning, inspection, test, etc.

The manufacturing activities of the Ordnance Department are under the supervision of the chief of manufacture, whose office is divided into four operating branches. These four branches, and the application of standardization principles to their respective activities, may be set forth as follows:

General manufacturing processes owe a great deal to the Ordnance Department of the Army. The science of this interchangeable manufacture that has revolutionized industry, began in this country in 1798, with the filling of a contract for 10,000 muskets. In 1812 interchangeability had become a normal contract specification of the War Department. Out of this development naturally came some consideration for what is known as scientific shop management. The well-known authority, Doctor Taylor, makes frequent reference to the work of the Army in this field. He states that the card system of shop returns, which was a very important development, was first employed in the shops of the Frankford Arsenal.

Gage section.

The standardization of design on gage blanks for plain and thread plugs and ring gages, by the American Gage Design Committee, is of immense economic value to the Ordnance Department. How much, is rather difficult to estimate, but it is safe to say that the gage production of the country, on account of this standardization, probably will be doubled, without increase in present facilities, and also, purchasers will be enabled to buy gages of this class from stock, thereby saving considerable time in waiting for the gages to be made up after the order is placed with the gage manufacturer, which has hitherto been the custom. It may be well to mention here that about 70 per cent of the gages used in industry fall in the class stardardized by the American Gage Design Committee

Artillery division.

The artillery division is responsible for the procurement of approximate'y 200 major items of ordnance, including guns and carriages, with their recoil mechanisms and fire-control instruments, accompany vehicles, tractors, and tanks. Considering this wide variation in product, it would appear to be rather difficult to do much in the way of standardization. In fact, it would seem like attempting to find common ground for both the jewe'er and the locomotive builder.

However, closer examination of the problem indicates that within each subgroup and in many cases between such units a promising field actually exists. While each complete article of ordnance has no direct counterpart in the civil world, most components thereof have. For example, a certain combat vehicle may be a distinctly military article without commercial use. Its bearings, however, are, or should be, identical with those in anybody's automobile.

In view of the economic impossibility of building and storing items of artillery in quantities sufficient for a modern war, rapid large-scale production after a declaration of hostilities is required by our national policy. It is obvious that early manufacture can only be secured when as many elements as possible are commercial articles actually in stock, in process, or easily placed in those conditions. Many components will, of course, not be of that character. Even then, however, certain characteristics may be arranged so as to call for standard materials, the use of standard tools, standard treatments, and so on.

Subordinate to the above, but nevertheless important, is the standardization within the ordnance field itself. A gun carriage is after all a collection of wheels, axles, levers, brackets, pieces of angle or channel, and what not. In designing a new carriage for, possibly, a different caliber of gun it is not necessary to redraw every detail. In fact, the function of design, production, supply, and maintenance are all simplified by utilizing such parts over and over again. Whereas the coordination with commercial standards is secured by constant reference to commercial standards, Federal specifications, and the codes of national associations, this type of standardization is obtained by treating each noncommercial component as a separate problem of design, placing it upon a drawing by itself, and then utilizing that drawing as a standard in preference to creating a new one.

The latter process has not yet proceeded far enough to make a fair estimate of the savings which can be effected. Nevertheless, it may be said that in the case of fire-control instruments where approximately 150 distinct optical elements are required, standardization of lenses, prisms, reticles, etc., will eventually eliminate at least half of the present variety.

In this particular case there is an interesting by-product of standardization which deserves mention. Were commercial companies required in time of war to produce complete instruments, including optical elements, many first-class concerns would be automatically excluded by reason of lack of experience in the manufacture of the latter. However, by standardizing on selected varieties of optical glass, and on the dimensions and characteristics of finished elements, the latter can be fabricated in separate plants under strict technical control and then shipped to the first-mentioned factories for assembly. In no other way is it believed possible to meet the vast requirements which a real national emergency would entail.

Infantry and aircraft armament division.

In the manufacture of spare parts for rifles, machine guns, revolvers, and pistols it is very essential that standardized dimensions be used, not only for the parts themselves, but for the gages used in inspecting these parts to insure that complete interchangeability will result. In times of emergency more than one manufacturer will be engaged in the making of arms and the spare parts for same. A critical situation would exist if it were not possible to utilize the spare parts manufactured at one plant in the maintenance of arms manufactured at this or other plants.

The Ordnance Department has long recognized the vital relation of standardization of products and manufacturing equipment for efficient production and maintenance. As early as 1825 steps were taken to develop machinery for the production of interchangeable components of military rifles, and since that time standardization has been applied to practically all military equipment of a small-arms nature.

The Ordnance Department produces caliber .30, caliber .45, and caliber .50 ammunition of various types for the weapons with which the troops are equipped. There is 1 standard shoulder rifle, caliber .30, M1903, 1 standard Browning automatic pistol, caliber .45, M1911AI, and 1 standard Colt revolver, caliber .45, M1917. There are 2 standard types of automatic rifles, a Browning automatic rifle, caliber .30, M1918, and a Browning machine rifle, caliber .30, M1922. The machine guns consist of 6 standard types; 4 caliber .30 machine guns and 2 caliber .50 machine guns. The caliber .30 machine guns consist of Browning tank machine gun, M1919; Browning water-cooled machine gun, M1917; Browning aircraft machine gun, M1918MI; Browning aircraft machine gun, M1919. The caliber .50 machine gun consists of Browning water-cooled machine gun, M1921; and Browning aircraft machine gun, M1921.

To facilitate the manufacture of these small arms, they are designed to give a maximum interchangeability of component parts. This interchangeability exists in the automatic rifles and the caliber .30 and caliber .50 machine guns. The following statistics are given for the guns designed with the maximum of interchangeability of components: The total number of components required for the two types of automatic rifles, namely, the Browning automatic rifle, M1918, and the Browning machine rifle, M1922, is 244. Of this number, 206 are the same for both weapons. The caliber .30 Browning tank machine gun, M1918, and the Browning machine gun, water-cooled, M1917, have a total of 397 components. Of this number, 304 are the same for both weapons. The two caliber .30 machine guns, M1922 (water-cooled and air-cooled) have a total of 612 components, of which 410 are the same for both weapons.

The standardization of components, as given above, not only facilitates the manufacture of small arms in respect to manufacturing equipment, but also facilitates the storage and issue of spare parts. The cost of production and output per day are also favored by the adoption of interchangeable components.

Ammunition division.

One of the essential factors in the design of ammunition components is the readiness with which such designs lend themselves to large production, in a wide variety of commercial companies, in the event of an emergency. Such designs must be carefully scrutinized to insure that dimensions, with their tolerances, permit of practical machining and that, specifically, close tolerances are not required unless essential to proper functioning of the component. Furthermore, that parts are dimensioned to insure the type of fit necessary without placing an undue hardship or handicap on the producer by requiring closer fits than are necessary.

The experiences of the World War are still sufficiently fresh in the minds of the ordnance ammunition designer so that the stamp of approval is not placed on such designs until considerable thought has been given to whether or not the components lend themselves to quantity production. Not alone is it sufficient that this material be produced in Government arsenals by personnel already familiar with such items, but it is hoped to have orders placed with commercial companies to further prove its satisfactoriness for large production in the event of an emergency.

What, then, is more important than that the design and the material that goes into it conform to the common standards of commercial production? While even in time of peace, procurement of ammunition is facilitated by utilizing material that is standard and readily procurable, by dimensioning details so that dimensions and thread sizes can be understood and worked to, and permitting in the manufacture of the part as much standard tool equipment as possible, such a procedure becomes of far-reaching importance in the emergency production of ammunition. At that time these designs of ammunition, with which the commercial manufacturer is unfamiliar, must go out to many plants of different kinds of products.

If we have been fortunate enough in showing the design in a manner with which he is familiar, in specifying materials that he can readily procure, and in having the design so that he can adapt his equipment to producing it, so much sooner will it be possible to place ammunition in the hands of troops requiring it.

Ammunition not of general manufacture.

Ammunition is markedly different from any article of commercial manufacture. In an emergency, when commercial concerns must produce munitions, the fact that ammunition differs so much from that which they are accustomed to producing creates initial difficulties. Every effort is therefore made in the design of am-

munition components to permit of the use of commercial or standardized practices in their manufacture. Standard materials and those of standard shapes and sizes are so specified wherever possible. Wherever it is practical to do so, standard screws, pins, sheets, and screw thread sizes are used.

Descriptions of manufacture are prepared for practically all components of ammunition. These are for the purpose of aiding prospective manufacturers and to assist them in obtaining early and quick production of ammunition in an emergency. In these descriptions particular care is taken to specify machine tools and practices that are common or standard in the industrial world.

All new methods of manufacture that are developed and adopted by the industries of the country are carefully studied, with a view to their utilization in an emergency for the manufacture of ammunition. Thus, while certain of the standards developed commercially can not be adopted wholly in every case for ammunition components, every effort is made to incorporate such standards, or at least to bring the ammunition components and their methods of fabrication so nearly like the standards, that little or no confusion would be encountered if industry was required to manufacture ammunition.

Meaning of "standard" in munitions.

The interpretation of the word "standard" in munitions means a round of ammunition or item of issue that has passed all the tests and met all of the specifications required by the using branches. In order to have any article adopted as standard by the War Department, such articles must have passed proving-ground tests, followed by an extended service test, conducted by the branch of the service for which the article is intended, under conditions simulating as closely as possible those of actual service in warfare.

The article must also be proven to be capable of being manufactured economically and expeditiously in the quantities required during a major emergency. It will thus be seen that a standard article of ammunition must meet requirements very similar to an article that may be considered as a commercial or general standard.

STANDARDS FOR REFINERY EQUIPMENT

Oil Industry to Investigate Possibilities of Standardization in Refinery Equipment

Possibilities of standardization of refinery equipment are to be investigated by the American Petroleum Institute, it was decided at a meeting of the division of refining, held at the institute's headquarters in New York on May 1. A committee, headed by Henry Thomas, of the Sun Oil Co., Philadelphia, Pa., was appointed to consider the project and report its findings to the division.

General opinion at the meeting of the refining division was that the new project of standardization of refining equipment will not have quite as wide an application as in the producing industry. In that branch the American Petroleum Institute has been working with marked success for a number of years. It was the opinion of the meeting that standardization in the refinery probably will be limited largely to auxiliary equipment. Crude oils vary so widely that it probably would be undesirable to attempt any strict schedule of standardization of distillation equipment such as stills and towers.

The field of standardization in the refinery, according to those present at the meeting, could well embrace fittings, piping, control apparatus, and the like. Standard alloys may be developed to resist various degrees of corrosive action, for example. Standardization of pipe, valves, and fittings for high-pressure service may also be a field for investigation.

SODIUM OXALATE AS VOLUMETRIC STANDARD

Bureau of Standards Issues Revised Circular on Latest Standard Sample for Analytical Work

In order to bring up to date the information on the standardization of solutions by means of sodium oxalate, the National Bureau of Standards announces that its Circular No. 40, Sodium Oxalate as a Standard in Volumetric Analysis, has been revised and reissued as Circular No. 381.

This was done in connection with the analysis of the new lot of sodium oxalate No. 40c, which is to replace the present sample No. 40b. Some new tests for purity and data on the effect of rapid titration are given. This will be of considerable interest to chemists who make use of these standard samples in their analytical work. Copies of the revised circular may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents each.

SPECIFICATIONS FOR "MATTRESS LUMBER" DRAFTED

United States Army Cooperates With Industry in Using American Standard Lumber for River-Improvement Work

One of the biggest lumber items used by the Army engineers in river improvement work is mattress lumber, which is woven into "mattresses," used for the purpose of preventing stream-bed erosion which would result in collapse of the river banks.

The engineers were confronted with the problem of selecting lumber which may be woven without breaking and yet be of sufficient strength for sinking in the river without damage to the completed mattress. None of the American lumber standard grades had been found to be entirely satisfactory for this purpose, and the use required, therefore, a grade selectable from the middle commons.

Following several conferences between the Corps of Engineers, the National Committee on Wood Utilization of the Department of Commerce, and the National Lumber Manufacturers Association, definite specifications conforming as closely as possible to American Lumber Standards have been drawn up and approved by the Corps of Engineers. It is reported that the subject is one of great importance to lumber manufacturers.

SEQUENCE OF EVENTS LEADING TO THE ADOPTION OF A FEDERAL SPECIFICATION

By Maj. R. W. Voeth, *U. S. M. C., Secretary, Federal Specifications Board*

When the desirability of a specification for a specific commodity or service arises in the mind of any member of the Federal service he may refer it to the respective departmental member on the Federal Specifications Board. Upon motion by the member, the board considers the item, and, if the facts are not obvious, canvasses the various departments and establishments to ascertain the volume and the departmental spread of Governmental purchases thereof.

Assuming that two or more departments are materially interested in the item, it is referred to an appropriate technical committee for the ultimate submission of a suitable tentative Federal specification. The technical committee is enjoined to develop the best commercial practice covering the commodity, also to ascertain if there be any specifications extant that might reasonably serve the Government's requirements, and to canvass the various departments and establishments for samples and specifications that are adequately or inadequately serving the Government at the time.

With the results of these inquiries before the technical committee, the committee endeavors to fit the Government's requirements into the commercial picture and to formulate a Federal specification accordingly.

Industry cooperates.

This specification, as agreed upon by the committee, is circulated to the industry for comment and criticism. The comment and criticism thus developed is acted upon, and a tentative Federal specification is recommended by the technical committee to the Federal Specifications Board for circulation to the respective departments and establishments of the Government for their comment and criticism.

These comments and criticisms are returned to the technical committee for further consideration. Comments offered are considered upon their merits, and after the committee has fully weighed the material offered, the resultant specification is forwarded to the Federal Specifications Board with recommendation that it be adopted as a Federal specification. Favorable action looking to its adoption is taken by the board at its monthly meeting, and in due course all departments and establishments of the Government and the commercial world, by mailing lists and trade journals, are advised of its official adoption as a Federal specification.

Ultimately the specification as adopted is printed, and in printed form is available to all activities of the Government and to the public in general. The Federal specifications are a part of the Federal standard stock catalogue.

Revisions of Federal specifications, which are both necessary and desirable, are taken up automatically by the technical committee concerned, in order to keep the specifications abreast the best current commercial practice, or they are referred to the committee for suitable action by the Federal Specifications Board when necessity for such revision becomes apparent.

As the work of the Federal Specifications Board progresses, there is to be noted a diminishing of the diversity in the specification requirements of the various departments, which was much in evidence prior to the establishment of the board.

TAPERED SHAFT ENDS

Proposed Addition to Society of Automotive Engineers Standard

During the latter part of last year a small tapered shaft end designated as proposed S. A. E. No. 0, was submitted to the aircraft-engine division of the Society of Automotive Engineers for consideration as to its adoption as an addition to the present S. A. E. standard on spline-shaft ends.

It was stated at the time that this was drawn up that there are a number of small engines using special tapers which could and should logically use this proposed No. 0. While the number of these engines is not large, it is considered advisable to add this shaft end to the standard in view of the development of many small engines now being designed for use on gliders and small 1-place airplanes.

It is likely that a still smaller shaft to be known as No. 00 will be developed to provide a suitable shaft for engines of 20 horsepower and thereabouts, many of which are now in development. These engines are largely of the 2-cylinder opposed type, and it will probably be advisable to develop the shaft end before several sizes come into use. Pending this development, however, the aircraft-engine division has recommended that the standards committee of the S. A. E. approve the addition of the No. 0 size to the present specifications.

STANDARDS OF DESIGN FOR CONCRETE

A new engineering treatise entitled "Standards of Design for Concrete" has been published by the Bureau of Yards and Docks, of the Navy Department. This work is the result of an intensive study of past and current practice in concrete design, and includes several new developments in this field, which constitute distinct improvements over former practice.

"Standards of Design for Concrete" has been complimented by some of the high engineering authorities of the country, and owing to the interest of many activities of the Government in this type of construction, this publication should prove of great value to engineers, and others interested in concrete design. The booklet is obtainable from the Superintendent of Documents, Government Printing Office, at 50 cents per copy.

STANDARD COLOR FOR MACHINE TOOLS

Machine Tool Builders and Users Eliminate Confusion of Color by Adopting Gray as the Standard Color

By Ernest F. DuBrul, *National Machine Tool Builders' Association*

The announcement that the machine-tool industry had adopted a standard color for all machine tools aroused a considerable amount of interest, both as to the reasons for this adoption and as to the steps taken to bring it about. There were pressing reasons for establishing a standard color for machine tools. Formerly each machine-tool builder had his own idea of a color for his machine tools. In many cases he thought that a distinctive color would identify his machine above all others when the machine got into the user's shop.

Here the user began to take a hand, because, with all these multicolored machine tools, his shop presented a polychromatic effect. Larger users then adopted standard colors of their own, and ordered the machines they bought to be painted to the user's own specifications, even specifying the particular brand of paint to be used. Then the machine-tool builder's paint room troubles began.

There was interminable and costly confusion in keeping the different customers' paints apart, and in changing the paints in the spraying equipment. Machines would go out painted with the wrong color in spite of the greatest care on the part of the builder. Troubles arose in getting small shipments of paint from the different manufacturers specified by different users. A paint manufacturer who was not the builder's regular source of supply would not be very much interested in an order for one can of paint of a special color. Making up small orders was a nuisance, and inevitable delays ensued in getting the paint. Other difficulties arose from the color not coming out as the user expected it to come.

Shipments delayed.

Shipments of machines were often held up waiting for a can of paint. This tied up capital in inventories and caused loss. The writer personally saw a $25,000 machine that had been held up nearly 60 days waiting for the user's particular kind of paint to come to the shop for application. These conditions finally grew to be so intolerable that something had to be done in the interest of both machine-tool builders and their customers. Discussion of the situation by the builders developed a strong sentiment in favor of selecting a standard color for machine tools and having all machine-tool builders use this standard color.

A committee was appointed to solve the question. The committee secured samples of the paints used by leading machine-tool builders and made panels showing all these colors, which were shown at a meeting of the association. There were nearly as many colors as a leading food house has pickles.

The paint manufacturers also liked the idea of a standard color which would permit of quantity production instead of the small-scale production of special colors. In conjunction with a committee of paint manufacturers, a color was chosen that could be made of pigments which would not seriously be affected by alkalies and acids in oils, cutting compounds, etc. The committee then sent a panel showing this color and surface to all of the members of the association, together with a wet sample. The members of the association were asked to vote on this color and to say if they would use this color as their standard. They were also asked to paint all of the machines that were to be exhibited in the association exposition in 1929 with the standard color. All the paint manufacturers who regularly furnished paint to machine-tool builders were supplied with samples from the association's office.

Committee's report accepted.

By an overwhelming mail ballot the committee's recommendation was accepted, and when the exposition was held in Cleveland in the fall of 1929, it made a fine demonstration of the uniformity of color that a user could get.

The next problem was to establish this color standard in practice. Some users continued to ask for the special colors which they themselves had decided upon for their own shops. A technique was worked out for informing the users on this point. Effective suggestions were given to the members of the association, to be used with such customers. These suggestions pointed out that the user needed two things—first, uniformity of color, and second, a good paint for the purpose—and that these were both provided by the association's standardization. When these facts were placed before them nearly all users agreed to have their machines painted in the uniform standard machine tool gray.

For their own individual reasons a half dozen users still desire their own special colors to be continued. But it is now well understood and well demonstrated that to provide a special color costs somebody some money, and it is not fair to those who accept the standard color, to furnish special colors to others, unless they pay the extra cost involved. Therefore, the machine tool builders have very generally adopted the policy of making an extra charge for painting any machine with a color which is off standard. The few users who prefer their own particular color are willing to pay this extra charge and do so. Most users, however, accept the standard color rather than pay the extra charge for a special color.

BOYS' BLOUSES, BUTTON-ON WAISTS, SHIRTS, AND JUNIOR SHIRTS

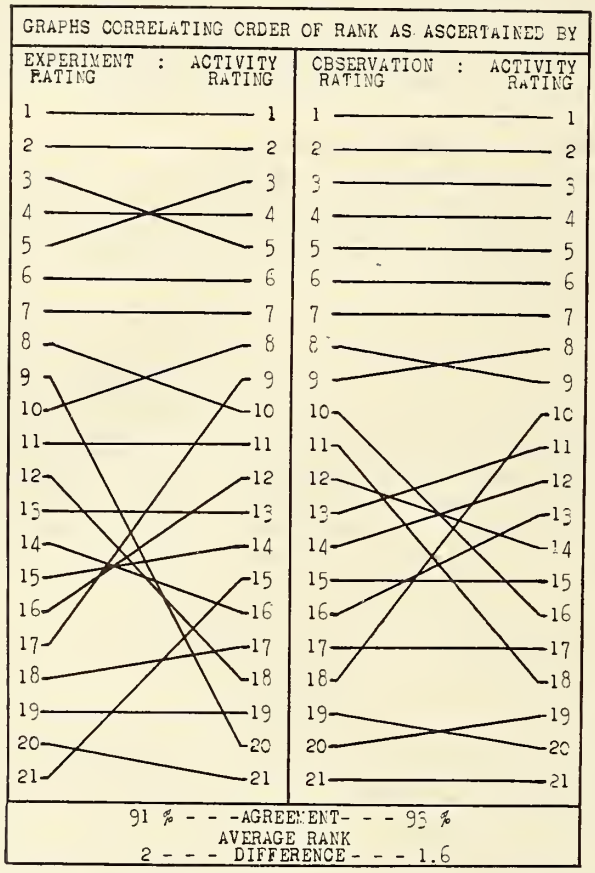
Following the presentation of certain suggested changes in the recommended Commercial Standard for Boys' Blouses, Button-on Waists, Shirts, and Junior Shirts on the part of interested manufacturers, a revised draft dated April 19, 1930, has been circulated to producers, distributors, and users for written acceptance. The changes involve modifications in the length measurements for all garments listed as well as minor changes in some methods of measuring these garments. Mimeographed copies are available on request.

STANDARDIZATION IN SPORT

Experts Measure Response, Speed, and Strength; Present Tendency in Modern Sports Toward Recognizing Physical Types; Standardized Sports Promote Individual Development, Keen Sense, Strong Body, Alertness, and Eagerness for Action

By Henry D. Hubbard, *National Bureau of Standards*

Continuing our discussion from last month's issue of the Commercial Standards Monthly, we find that the skill and prowess of various ages or types call for a natural segregation into age, skill, or weight groups to restrict each competition to fairly comparable contestants. Field meets for high schools are distinct from those of colleges. The advantage of weight is at times such that boxers, for example, are strictly standardized into " weight " classes.



Activity ratings of 21 athletes compared with rating by Schulte predicted from experimental and from observational data on the same 21 athletes

(Horizontal lines indicate perfect prediction.)

Medical advice is usually sought before accepting players for severe sport and is followed up, in some cases, by daily inspection during training or during the active season. With a full knowledge of motor ability rating (MA) and the achievement quotient (MAQ) and a study of measured characteristics, prediction of specific ability to learn a new sport may be made with high correlation coefficient. Experimental predictions of unfitness to learn flying were successfully made by psychomotor tests in 77 per cent of the cases in a research by Reid for the Royal Air Force Medical Research Laboratory, as reported by Flack. Predicted ability was confirmed by an 80 per cent correlation with actual experience in which neither trainer nor student knew of the rating. Schulte found a high correlation (91 per cent) between experimental prediction and actual sport performance, and an even higher correlation between observation rating and actual performance. Astonishingly high correlations are shown graphically for a group of 21 athletes. This article is designed to give a few typical examples of measurements and the results of correlations merely to illustrate some trends toward measured control in sport.

Standard motor ability rating.

Motor ability (natural aptitude) is sharply distinguished from skill in games, in strict analogy with the psychological distinction between intelligence and knowledge. Scientific correlations bear out the distinction. Intelligence, however, shows low correlation with success in games. Field events show a high correlation with motor ability, increasing with the number of events taken into account.

Seventy-five physical educators rated the suitability of four types of criteria for use in the Brace general motor ability test, assigning the following (average) order: Learning new activities easily (the best criterion), 1.76; skill in a variety of activities, 2.02; easy and graceful form in performance, 2.41; great ability in some special line (lowest), 3.81.

The same educators numerically rated 10 specific motor activities used to measure and rate general motor ability—tumbling and stunts (highest), 2.5; dancing, 3.9; track and field sports, 4.0; apparatus exercise, 4.3; basket ball, 5.0; swimming, 5.8; baseball, 6.2; field hockey, 7.4; socker football, 7.5; gymnastic drill (lowest), 8.7.

Fifth-grade pupils can rate each other on motor ability on the Brace system in about an hour for a large group. The types of activity tested by the motor ability test comprise agility, balance, control, flexibility, and strength.

Motor ability ratings show high correlation with the best aggregate scores of players in a varied set of athletic events. To offset undue specialization in sport, the decathlon was devised, in which each contestant is rated on 10 athletic events, the winning score combining the ratings in all 10 sports. On a decathlon test for boys Brace obtained a correlation coefficient of 0.80 with a probable error of only 0.01. This high correlation was obtained without weighting the scores. Team members showed about 30 per cent higher on mean scores than the entire student body. The coefficient was greatest when the largest variety of events was utilized. The correlation percentage is computed scientifically, and its validity and reliabil-

ity are readily measured. If motor ability (MA) rating is divided into the game score rating, the achievement quotient (MAQ) measures the extent to which the athlete has developed and applied his natural aptitude or ability.

While motor ability ratings do not aid the player's action in a given sport, they are used (1) to compute "accomplishment quotient" (MAQ), (2) to classify students for programs of individual development, (3) for the diagnosis of specific disabilities, and (4) to conduct researches in which equated groups are compared for standardized tests.

Rogers has a strength test which includes a vital capacity score. The total strength score is called an individual's "SI" (strength index). Strength index norm tables are available for all ages and weights up to 25 years. The individual's SI divided by the "normal SI" gives the physical fitness index (PFI) comparable to an IQ and Brace's formula (MAQ). The test is being actively applied in the State of New York as a method of classifying school children and adults by measuring strength and physical fitness.

Measuring response, speed, and strength.

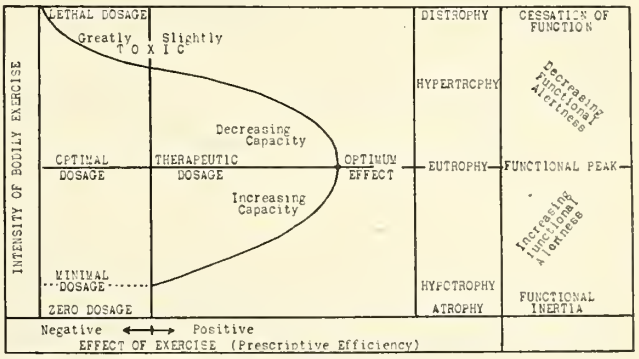
To-day anthropometry measures length of limb, height, body proportions, weight, girth of muscles, lung capacity, strength of muscle, quickness of action, reactance to various stimuli, endurance, heart rhythms, and blood pressure as affected by activity.

To-day time reactions are intensively studied. We know what standard responses may be expected and what deviations may be found. Graphs are plotted for all types of response to stimuli. Sample response times to signals are, for a visual signal, 0.175 second; for an audible signal, 0.125 second; for a tactile signal, 0.110 second. The dynamometer has thus advanced the measured control from form to function, and is now used to measure the strength for sport and its decrement gradient, fatigue. Such measures may aid in fixing scientific standards of prescriptive effort, beyond which it may be dangerous to pass.

A graphic schematic analysis (suggested by Schulte) of the effect of prescribed dosage of bodily exercise is shown. The base is zero action, atrophy; the vertical scale is intensity of exercise or its duration. The effect, favorable or otherwise, is on the horizontal scale, positive or negative. The optimal dosage is about halfway up the scale, and doubtless varies with age or condition. An increase above the optimal causes rapid increase in the toxic effect, ending in the lethal dose shown on the curve at the upper left. Some data for such study for each individual may be had from the form of the fatigue curve, the slope of which roughly measures what the individual can stand. Distress is studied by the time required after a standard sport event to recover normal functioning. Boigey, studying 26 cases (ages 14 to 18 years), found 40 minutes to 9 hours necessary for return to normal status after a 100-meter dash and 4 to 9 hours necessary for return to normal after a 3,000 meter run. One group of five in the latter event required 17 hours for complete return to normal.

Studies are also made of action characteristics in various sports. Coordinated action is a characteristic of the individual. The speed changes during a race are measured. In a typical graphic study by Schulte the variation in speed for 60 runners is shown, the winner finishing in 11.16 seconds. During the first fifth the speed averaged between 5 and 7 meters per second, rising to 7 to 9.5 meters in the second fifth. The peak occurred in the fourth 20-meter stretch when 10 meters per second was reached. Such studies suggest that a similar characteristic speed-time curve is ascertainable for each racer by which he may run 100 meters in minimum total time, and that similar curves might be made for each different distance run.

Recovery from sport effort is another subject of quantitative experiment and measurement. This vital point may yet be rated systematically in every type of sport, so as to standardize permissible severity of sport activity in full light of measures of individual fatigue and recovery rates. Such standardization would minimize overstrain in competitive athletics while retaining play for its value as "the most important form of education as a training in intense and eager application." (W. S. Franklin opinion.)



Intensity of prescribed bodily activity as affecting the bodily functioning

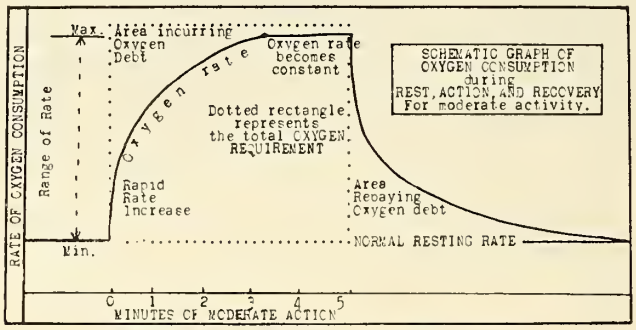
(Schematic graph adapted from Schulte.)

The undoubted value of play is evidenced in the results of the Locust Point experiment designed to gage the effect of supervised play in its relation to health and education. The pupils of the Locust Point School in Baltimore as an experiment, later for practice observation, spent one-third of school hours in class room and two-thirds on the playground in supervised play. Health notably improved, absence from illness dropped to one-half, and educational progress measured by reading tests was three times faster than under the old plan. Results so surprising call for study and fuller confirmatory experiments. They are cited as experimental measurements tending to ascertain the standard effects to be expected with so large a part of the time spent in bodily activity.

The study of the athlete as a mechanism is not new. Graphic records facilitate dimensional and performance development by standardized activities and controls. Bodily motions are studies quantitatively and dynamically and yield valuable results for use in sport. To study technique too rapid for unaided visual analysis high-speed cameras are available, motion pictures being slowed down in screen projection. Thus Walter Johnson was photographed pitching a ball, 3,200 pictures being taken per second, these being slowed down to 1/200 natural speed for study on the screen. Similar slow movies are made for almost all

kinds of sport—golf, diving, racing, polo, tennis, and form a subject of interest in the analysis of skill. They throw light on the secret of the champion's skill, often unknown to the champion himself, and afford the novice facilities to study masters of play slowed down in point of time to observable speeds.

For still more intensive motion studies, the photo-cyclochronograph is used. Light pulses from a small electric lamp record in three directions a skill motion the pulses measuring stages, and the dotted light traces permitting a time-sealed 3-dimensional wire graph to be made. From Marey to Gilbreth and



Oxygen requirements for various speeds

(Graph adapted from Hill.)

present-day investigators beautiful demonstrations have been made of methods of visualizing the spatial and time relations of bodily movements. Graphic methods still in their infancy bid fair to perfect high-speed cinematography for making graphic, tangible, and enduring records of skilled motions, slow or rapid, to capture the elusive skill of the expert champion for the world to study, analyze, and assimilate.

To science, man is a biochemical engine, a prime mover in which not expansion, but contraction applies the power through a great number of lever mechanisms and some 230 perfectly lubricated bearings. Expansion of the muscle after contraction restores the levers to starting position. Standardization of bodily movement strikes energy balances and correlates action and oxygen intake—a relation almost as definite as that between motor power and fuel burned. This has quite revolutionized the standardization of physical measurements in sport, and dietetics and action for the athlete. Fatigue is measured and correlated in the individual case with oxygen intake and the respiratory quotient (CO_2/O_2). The muscular action, however, differs in principle from that of a motor, resembling more closely that of a storage battery, receiving energy, storing it as glycogen, then causing a chemical reaction which shortens the muscle, pulls a lever, and produces the bodily action.

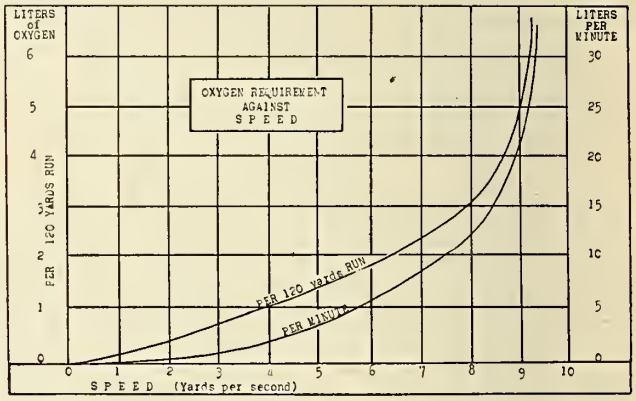
An athlete really utilizes the energy furnished, it is believed, by converting glycogen into lactic acid. He may at rest use 200 milliliters of oxygen per minute, while walking increases the consumption to five times this amount, say, 1 liter per minute. Blood is pumped correspondingly faster, the oxygen intake being augmented by quicker and deeper breathing. The increase in oxygen is used among other purposes for two muscular pumps—the blood pump, or heart; and the air pump, or lungs—both vital parts of the bodily mechanism. A typical curve of oxygen consumption during rest, exercise, and recovery is given by Hill.

The oxygen serves to reconvert the lactic acid into glycogen by a complex reaction but excess of unconverted lactic acid, say above 28 grams, leaks into the blood stream where it accumulates until it reaches a critical point forming 0.003 of the muscle weight, when the muscle fails to respond and collapse occurs. Research shows that the human body is 25 per cent efficient, about equal to an automobile. By training, however, the efficiency of the bodily machine may be raised to 40 per cent.

Mechanical aids in sports.

The use of mechanical aids has developed in some sports as it has in handicraft. These have developed into mechanisms of great power, subject eventually to technical and commercial standardization as sport equipment. Motor craft permit phenomenal speed—the motor car, 200 miles an hour; the airplane, 300 miles an hour. Record making is transformed from personal achievement of skill, speed, or prowess in the field or air to the laboratory, designing room, and shop. Mechanisms surpass men or animals as the amazing nonstop transcontinental runs, mountain races (Pike's Peak and others), as race-course records show.

Sports with mechanisms test the design and construction and are valuable in perfecting motor craft. Such craft are usually designed to run at whatever record-breaking speed is needed to win a particular event, on a particular course—notably the Don's "Silver Arrow" and the Williams plane. The bodily limitations of the athlete do not hold with such mecha-



Oxygen assimilation during rest, action, and recovery

(Graph adapted from Hill.)

nisms. Stabilization of planes in flight is now designed into the aircraft, while the supercharger gives increased air supply. The latter device may become standard for automobiles, for sport is a proving ground for facilities which later add speed and effectiveness to transport for other purposes.

Mechanisms—airplanes, aquaplanes, motor boats, and motor cars—which so excel bodily action, furnish mechanical substitutes for such sports as overstrain the athlete. Spectators may come to enjoy such mechanical displays as much as those of athletes. In these new types of sport the athlete controls the mechanism, but the technical interest shifts to the design of the mechanism with its susceptibility to increase in

power, speed, and ease of maneuvering. The designers vie in skill and science in a technology later to be generalized for human service.

Effect of modern sports upon player.

An outstanding note in modern sport is the stress on the effect upon the individual player. The therapeutic values of the several sports are matters of common knowledge and are prescribed in medical practice, as are climates, diets, or other therapeutic régimes. Standards of physique are really standards for the human personality itself. Equipped with a standard anthropometric chart and a set of body measures and functional measurements, the physical director developes his subjects toward standard appropriate physical type—not one but many—based on scientific and artistic studies of anatomy, physiology, and sport, comprising measurements of millions of individuals. The beauty of form demanded in motion pictures is an asset which calls for rigorous control of weight and body measurements, through prescriptive régime of body activity and diet.

A trend is discernible away from strict standardized discipline and coordinated mechanical movements executed on command. Bukh in Denmark with his naturalized programs is an example of a formal movement toward this end. Experimental research departments in schools and colleges are also trying out new ideas in a scientific manner, as in the Detroit schools. Group needs are studied, specific activities prescribed for all in place of intensely specialized effort for the few. The results are tested and correlated with health teaching in each grade.

Spontaneous play cultivates effort.

Maximum interest demands free play of the powers in a sport. A maximum of data, observation, and suggestion during training, with a minimum of conscious attention to formal principles in actual play leaves only the end to be attained as the single object of endeavor. Such spontaneous play cultivates the habit of putting forth supreme effort (without overstrain)—as the highest gain which sport contributes to the individual or the world.

The stadium and its sports, the park and its games, and the playground with its directed play are the modern assize to measure youth, its skill, speed, strength, and endurance, and to set measured standards of performance for the body, new standards of achievement—while measurement plays its part in perfecting the race of youth for the world of to-morrow. Shorn of needless risk and invidious features, standardized sports may yet form varied régimes of play under which each individual may be molded physically, during plastic years of life into an ideal individual—keen of sense, strong of body, perfect in form, alert, eager for action—the most efficient personality in each case which science and education can produce.

A. S. T. M. ORGANIZES SUBCOMMITTEES ON HOLLOW BUILDING UNITS

June Conference of Society to Consider Recommendation of Interest to Industry

The American Society for Testing Materials committee on hollow masonry building units has organized its subcommittee structure into five groups, each of which is detailed to work on specific problems. One of these subcommittees on concrete masonry units presented for committee discussion tentative specifications and tests for concrete masonry units; tentative specifications and tests for nonload-bearing concrete masonry units; and tentative standard definitions of terms relating to concrete masonry units.

The committee has decided to submit to the American Society for Testing Materials at the June meeting, recommendations to advance to standard the present tentative specifications and tests for hollow burned-clay fireproofing, partition, and furring tile with such modifications as would make the classification be based on absorption. Since such units in service are not required to carry load, strength is not to be made a requirement for classification.

The tentative revision recommended last year in the standard specifications for hollow burned-clay load-bearing wall tile and for standard specifications for hollow-burned-clay floor tile involving a change in the absorption requirements will be recommended for adoption as standard. A further change in the standard specifications and tests for load-bearing wall tile consists in setting a higher weight allowance which would permit the unrestricted use of the standards where local requirements specify heavier shell and web thickness than those generally used.

ANNULAR BALL BEARINGS

Proposed Revision of Society of Automotive Engineers Standards

In 1918 the sectional committee on standardization of ball bearings was organized by the Society of Automotive Engineers and the American Society of Mechanical Engineers, as joint sponsors under the procedure of the then American Engineering Standards Committee, now the American Standards Association, to cooperate with the national standardizing bodies in several countries abroad toward arriving in so far as possible at international standardization of antifriction bearings, the project at that time relating to the radial and thrust types. International communications were maintained and resulted in a revised standard for single-row annular-radial ball bearings that was approved for adoption as an American standard at the annual meeting last January.

The ball and roller bearings division of the S. A. E. has since then studied the present standards for the separable (open) type and the angular contact type of bearings published in the 1930 edition of the S. A. E. Handbook, in order to bring them into line with the new tables for the annular single-row type. The revisions proposed do not affect the basic bores, outside diameters, and widths of these bearings for their ranges of sizes, but bring the decimal equivalents of metric dimensions, the tolerances, corner radii, radius, and eccentricity-tolerance specifications into conformity with the annular single-row type. The minimum shoulder-heights have been added in these tables. These proposals are subject to final letter-ballot approval by the aircraft-engine division of the Society of Automotive Engineers.

STANDARDIZATION URGENTLY NEEDED IN PRINTING INDUSTRY

Bargain Buying of Nonstandard Sizes Makes for Expensive Stock

By J. T. Roach, *Roach Paper Co., Little Rock, Ark.*

Wells in his "Outline of History" says the invention of paper, rather than the invention of printing, made modern civilization possible; for, without paper what would they print on?

Years ago paper manufacturers saw the need of standardizing on certain grades of paper. In any process as precarious of exact results as paper making, it is only through consistent running of a few grades that real standardization may be attained. Likewise, standardization is the keynote of successful paper merchandising. It is protection to the merchant and to the printer customer.

The printing industry, too, for self-preservation, is swinging into standard grades. The old idea of cutting sharp corners defeated itself because it destroyed standards of value; and when that happens buyers get stubborn and lash around like wounded sharks.

The National Bureau of Standards has done good work in assisting industry in reducing the number of paper sizes. And the buyers of paper have written a second line to that, by reducing a demand and necessity for too many grades. However, old habits and customs are hard to overcome, and we still find in some plants a few sheets of each of the 5,700 varieties, and not enough of any one kind to print a fair-sized order. The owner of this cosmopolitan corpse will doubtless tell you that he makes a lot of money buying; but go down and have his fortune told by "Senor Bradstreet," and the chances are that the report will reveal that all this money he has made is still in his stockroom in the form of unsalable paper. The present-day distribution methods have eliminated the necessity for the printer to carry extensive stocks, and to buy his paper from some distant point.

It is believed that the most expensive stock shelves ever seen are those loaded with paper that is readily recognized by a paper man as having been bought at a bargain. The general increase in the cost of conducting businesses of all kinds has brought about in the paper business the necessity for increases in the charges for special handling, special packing, and less-than-mill packages. This alone is doing much in the way of reducing the number of grades that printers buy. Merchandising is nothing more or less than orderly and profitable distribution of standardized lines. (National Printer Journalist, May.)

NATIONAL ENGINEERING INSPECTION ASSOCIATION FORMED

Association Will Work for Better and More Effective Inspection Methods

In December, 1929, a group of inspecting engineers and representatives of testing laboratories from all sections of the country met in Detroit, Mich., and formed a temporary organization among those engaged in the practice of testing and supervising the manufacture and use of various engineering materials for construction work of Federal, State, and city governments; public service corporations; railroad and highway construction and maintenance; bridges; office, manufacturing, educational and other building projects.

At a second meeting, held April 3 and 4, 1930, also at Detroit, the success of the preliminary gathering was continued and there was concluded the formation of the National Engineering Inspection Association. The officers elected were Watson Vredenburgh, president of Hildreth and Co. (Inc.), New York, N. Y., as president; J. D. Stoddard, vice president of The Detroit Testing Laboratory, as vice president; and B. H. Witherspoon, president of the Pittsburgh Testing Laboratory, as secretary-treasurer. The board of directors include the officers and a representative from each of the four geographical sections of the country as follows: Henry Gulick, president of Gulick-Henderson Co., New York, N. Y., for the eastern section, James H. Herron, president of The James B. Herron Co., of Cleveland, Ohio, for the mid-western section; F. B. Porter, president of the Southwestern Laboratories, Fort Worth, Tex., for the southern section; and Abbot A. Hanks, president of Abbot A. Hanks (Inc.), San Francisco, Calif., for the western section.

The association adopted a complete constitution with by-laws and code of ethics. The object of the association is to promote a proper understanding and cooperation among those engaged in and concerned with engineering inspection; to establish practices which will prove beneficial to proper service and to develop and encourage better and more effective inspection methods. Provisions are made also for constant supervision of the affairs of the association by the officers and board of directors as well as arrangements for semiyearly general meetings.

COORDINATION OF MARINE-BOILER RULES

At the request of a committee appointed at the suggestion of the Secretary of Commerce to coordinate marine-boiler rules, the administrative office of the American Marine Standards Committee is collaborating with representatives of the Steamboat Inspection Service and the American Bureau of Shipping in the preparation of a revised draft of rules.

Rule 1, comprising 18 sections on specifications for materials required for the construction of marine boilers and other pressure containers, piping, etc., has already been outlined. The preparation of a revised draft of rule 11, to comprise instructions for design and construction, will next be taken up.

THE NATIONAL HYDRAULIC LABORATORY

Congress Passes Bill Authorizing a National Hydraulic Laboratory to Be Established at the National Bureau of Standards

By H. N. Eaton, *National Bureau of Standards*

Since the beginning of the present century there has gradually come an awakening in the field of hydraulic engineering comparable to that brought about in aerodynamics by the introduction of the wind tunnel, by means of which valuable design data applicable to full-sized airplanes can be obtained from tests on small-scale wings, ailerons, etc.

We have been slow, however, to recognize that the same principles which apply to air flow and air forces also apply to the flow of water and that experiments made on small-scale models of hydraulic structures, such as spillways, canal locks, and even rivers, would furnish valuable information as to the conditions which exist in the full-scale structure, provided the experiments were carried out with due regard for the laws governing the transformation of results obtained in the miniature structure to its prototype in nature.

About 1875 a French engineer, Fargue, constructed a model of a portion of the Garonne River near Bordeaux and made observations as to the scour at bends which he applied to the actual river. In 1885, Osborne-Reynolds, in England, built a model of the estuary of the Mersey River to see if he could explain the course of the tidal currents observed in the actual estuary. He built the bed of his model estuary of sand, and, in addition to finding that the currents in the model did simulate those in nature, he found, to his surprise, that the sand bed of the model also gradually took on a form corresponding approximately to the bed contours of the actual estuary. Osborne-Reynolds determined the law of similarity which expressed the relation between the phenomena which occurred in his model and those in the Mersey, established the limits within which this law was valid, and hence for the first time placed model tests of this nature upon a scientific basis.

Hydraulic model tests were next taken up actively in Germany under the lead of Prof. Hubert Engels, of Dresden. He attacked actively, by means of small-scale model tests, problems relating to scour around bridge piers, formation of river beds, the effect on the course of the current of various types of dikes projecting out from the banks of rivers, and many similar problems. The marked success which followed his efforts brought about the immediate spread throughout all of Germany and into other countries of Europe of the idea of utilizing model tests in the design of hydraulic structures and for studying the control of rivers. The laws of similarity applying to such models were also developed in detail.

Little progress made in the United States.

During this time very little progress was made in the United States along these same lines, probably because American hydraulic engineers had but little contact with the European work and failed to familiarize themselves with European engineering literature. The remarkable progress made in Europe was first brought generally to the attention of American engineers through the efforts of the well-known hydraulic engineer, John R. Freeman.

While visiting the German hydraulic laboratories several years ago, he was surprised to see the extensive use of model tests which were being made in these laboratories in connection with the solution of practical hydraulic problems, and he became inspired with the idea of modernizing American thought and practice in this field. To this end he persuaded the heads of a number of the European laboratories to write descriptions of their laboratories and the researches which they were conducting. These descriptions were compiled and published in German in 1926 with the cooperation of the Verein Deutsche Ingenieure (Society of German Engineers). Later this book was greatly amplified and was published in English through the American Society of Mechanical Engineers, under the title of "Hydraulic Laboratory Practice."

Not satisfied with this contribution to the advancement of his profession, Freeman also established scholarships for the purpose of permitting young American hydraulic engineers to study hydraulics in the European laboratories. To date 10 such students have spent, or are still spending, a year studying abroad.

The effect of all this, together with the wide publicity which has been given his efforts, has been to awaken the hydraulic engineers in this country to a realization of the possibilities which lie in the application of model tests to the solution of hydraulic problems. Great progress has been made in some of our engineering colleges. The laboratories at the Worcester Polytechnic Institute and at the State University of Iowa are actively engaged to their full capacity with model tests of hydroelectric power projects and other problems relating to the flow of water over spillways and in open channels. The laboratory at the Carnegie Institute of Technology is rapidly becoming increasingly active in this respect, and other college laboratories are undertaking this type of investigation, owing to the fact that hydraulic engineers are sending their problems to properly equipped hydraulic laboratories in rapidly increasing numbers.

Freeman first proposed laboratory.

Freeman was the first to propose a national hydraulic laboratory, but Senator Joseph E. Ransdell, of Louisiana, had also conceived the same idea at an early date. As a result of conferences with Freeman, Senator Ransdell introduced a resolution into the Sixty-seventh Congress for the purpose of establishing such a laboratory. This failed of passage, and it was not until May, 1930, that the bill establishing such a laboratory at the National Bureau of Standards at a cost of $350,000 finally passed the Seventy-first Congress. This bill received the support of nearly the

entire engineering profession. Dozens of prominent engineers testified in its favor at the hearings or wrote letters urging the passage of the bill. About 40 engineering societies and associations also supported it. Rarely has there been such widespread interest in any piece of legislation of this nature.

The bill was also actively supported by several Government departments which have a great deal to do with hydraulic problems; in particular, the Bureau of Reclamation and the Geological Survey, of the Department of the Interior, and the Bureau of Public Roads, of the Department of Agriculture. Each of these departments has hydraulic problems which are in urgent need of solution and which can be investigated in the new laboratory. In spite of its immense construction projects in connection with irrigation works, the Bureau of Reclamation has never had a hydraulic laboratory in which it could study the problems arising in the design of its structures. Its capable staff of engineers has undoubtedly solved the problems confronting it as well as any other body of engineers in the world could have done without the aid of a laboratory, but we have their own testimony that they could do their work better if they had this valuable aid.

For example, in the design of the Boulder Dam, which will be the highest dam in the world, there are problems for which the engineers can find no precedent. Consequently the proper design of some parts of the dam will be a matter of opinion before the problems have been studied in the Hydraulic Laboratory, but after this is done it will be a matter of fact. A single mistake in the design of such a structure, because of the lack of exact information as to how the water will flow, might easily cost the Government more than the entire cost of the National Hydraulic Laboratory.

The Bureau of Public Roads also is interested in obtaining more accurate information as to the flow of water in irrigation ditches and its measurement, the backwater caused by bridge piers and other obstructions in streams, the scour about piers, etc. The Geological Survey is interested mainly in the measurement of stream flow. Its principal need is more exact information as to the various types of measuring devices, such as weirs and dam sections of various kinds, current meters, etc. It needs, in particular, tests of current meters in flowing water, as can be accomplished in a large flume.

The above-mentioned departments have conducted a limited amount of experimental work in existing laboratories. For some time the Bureau of Public Roads has conducted investigations at the Colorado Experiment Station at Fort Collins, Colo., and at the State University of Iowa. The Bureau of Reclamation is now planning to conduct at Fort Collins some tests, the results of which are needed immediately. Several times the Geological Survey has gone to college laboratories to study problems which were urgent. However, this work was nearly always in connection with specific engineering problems. There has never been the opportunity to conduct the general studies which would furnish information needed time after time in specific problems. There never will be such an opportunity until the National Hydraulic Laboratory is available with an adequate staff to permit such work to be carried on continuously.

Functions of the laboratory.

The new laboratory will have three principal functions. It will carry out fundamental investigations relating to all types of water-flow phenomena. This will include the accurate determination of flow coefficients, losses of head in various structures, the laws of the movement of detritus and silt in rivers and canals and similar problems. In the second place it will make model studies of proposed hydraulic structures to determine the form which is most effective in producing the desired results and which will be the cheapest to build and maintain.

The third function of the laboratory will be to conduct routine tests on all kinds of hydraulic instruments, meters and accessories, such as water meters, current meters and Venturi meters. At present it is not planned to install equipment for testing hydraulic turbines and pumps, but if a demand which can not be met adequately elsewhere arises, an attempt will be made to satisfy it. The National Bureau of Standards now receives occasional requests for pump or turbine tests from individuals who do not wish to have the test made by any manufacturer of hydraulic machinery.

The laboratory will probably be engaged principally with special studies and general investigations for the Government departments, States and other political subdivisions, which now have no adequate hydraulic laboratory facilities. It will not enter into competition with college and commercial hydraulic laboratories, but will rather aim to encourage such laboratories in any way possible. This is in accord with the general policy of the National Bureau of Standards not to undertake tests or studies which can be adequately and conveniently conducted elsewhere.

The laboratory investigations which are required by hydroelectric companies and other commercial organizations, and which are being undertaken in increasing numbers every year should be, and undoubtedly will continue to be, conducted in the laboratories of the engineering colleges or by the individual companies themselves, the latter being the case with the Alabama Power Co. This does not mean, however, that private individuals or organizations will be precluded from bringing to the National Hydraulic Laboratory problems which other laboratories are not equipped to handle.

To cost $350,000.

The bill authorizes the expenditure of $350,000 for the laboratory. There is a tacit understanding that approximately $300,000 of this amount will be spent on the construction of the building and the balance for equipment of a permanent nature; pumps, supply tanks, concrete flumes, a standpipe, etc. It is too early to say what the general form of the building will be, but it is certain that a large floor space free of fixed equipment and supporting columns will be provided for the construction of models of dams, rivers, and such other structures as will require study from time to time, and that provision will be made for tests requiring vertical extent. For example, it is hoped to

include in the equipment a cylindrical standpipe at least 80 feet high and a vertical shaft of this same height for work on plumbing stacks and similar problems.

Experience both in Europe and at home has shown that the most essential consideration in the design of a hydraulic laboratory is to provide as flexible an arrangement and ease of combination of the equipment as possible. The water used in the tests will be circulated by means of pumps; that is, there will be large, low-lying concrete supply basins filled with water which will then be pumped to higher steel tanks arranged with overflow weirs to maintain constant head. From these tanks the water will flow by gravity to the model being tested, will then pass to weighing or measuring tanks and then be returned to the supply basin.

Several horizontal flumes will be built with plate glass sides, thus furnishing a clear view into the flowing water so that complicated flow phenomena can be studied visually and photographically. Photography plays an important rôle in the modern hydraulic laboratory, since in this way transient phenomena which are sometimes too rapid for the eye to grasp can be recorded permanently. Of late the moving-picture camera has come into general use, particularly because of the possibility of slowing down the phenomena until rapid fluctuations can be followed with the eye and understood.

Great savings expected.

A laboratory of this type will inevitably bring about enormous savings in the construction of large hydraulic projects. No longer will the hydraulic engineer be obliged to follow slavishly the precedents of past structures and allow factors of safety far in excess of what would be necessary if he only knew in advance how the water was going to act. The laboratory experiments will tell him this before he settles upon his final design.

Experience has shown that the saving in initial cost on any one of many large structures has been more than sufficient to pay the entire cost of construction of the laboratory in which the work was done. But the saving in first cost is often only a small part of the total saving over a period of years when we consider the efficiency of the structure, the cost of maintenance, and the effectiveness with which it fulfills its intended function. Furthermore, there is a long record of expensive structures which have failed of their intended purpose because the engineers who designed them did not have sufficient information as to how the flowing water would act.

No reasonable and well-informed person could say that suitable experimental studies, such as will now be possible in the National Hydraulic Laboratory, would not have prevented at least a part of these heavy losses and that the laboratory will not prevent many such failures in the future.

STANDARD FOR GROOVED TROLLEY WIRE FOR MINE SERVICE

American Society for Testing Materials Committee Recommends New Specifications

The A. S. T. M. committee on copper wire at a meeting held in New York City on April 19 approved new specifications for grooved trolley wire for mine service, which will be recommended to the A. S. T. M. in June for publication as a tentative standard. The society, through this committee, began its work on copper wire with the issue of specifications for hard-drawn wire in 1909. In later years it interested the American Electric Railway Association in the subject of trolley wire, but progress in standardizing was slow until about five years ago, since which time the matter of trolley wire for railway service has been brought to joint standardization by the two societies.

With the report to be rendered in June there will be added to the trolley wire standards, specifications for the very large wire used in mine service. This will practically complete the work on trolley-wire standardization, since it will bring about uniformity of quality, and especially of dimension, which is of considerable importance.

The use of a grooved section of trolley wire has been increasing, and before standardization was accomplished the manufacturer of the supporting hardware had to carry stocks for the considerable number of different shapes and dimensions of grooved wire called for by different customers. The standardization by the American Electric Railway Association and the American Society for Testing Materials has resulted in the use of one form of grooved wire in the several sizes, and the manufacture of a uniform line of supporting hardware has been made possible. With the work already done and culminating in June, this has been extended to the one size of wire for which, heretofore, there has been no standardization.

BRITISH STANDARDS FOR SWITCH GEAR

The British Engineering Standards Association has issued specification No. 195–1929, dealing with switchgear equipments for 3-phase alternating-current circuits. It is a companion specification to No. 194–1926, which referred to switch-gear equipment for direct-current circuits.

The new specification has been drawn up with a view to specifying the least amount of apparatus which will control the machine or circuit and yet avoid fire hazards, discontinuity of supply, and danger to the operator. Separate schedules, entitled "Optional extra equipment," have, however, been provided. The necessary apparatus for grounding the neutral point of a 3-phase system, either solidly or through a resistor, is scheduled, and certain requirements are laid down regarding the accessibility of switchboards for cleaning and examination.

As in the case of specification No. 194, the schedules are accompanied by a series of diagrams illustrating each type of circuit for which standard equipment is specified. Incidentally, these diagrams afford an excellent illustration of the manner in which the British standard symbols for electrical purposes may be employed on such diagrams.

STANDARD TIME ZONES

International Standard Time Zones Adopted in 1884; System Was Legalized in United States in 1918

By R. E. Gould, *National Bureau of Standards*

From the earliest civilization man has reckoned time by the apparent motion of the heavenly bodies. The rotation of the earth on its axis from west to east causes these bodies to "rise" in the east and "set" in the west. Consequently points to the east of us have sunrise before we do, or as we say, their time is faster than ours; while points to the west have time that is slower than ours.

This rotation of the earth upon its axis once in 24 hours gives a time change of 1 hour for every 15° of longitude; that is, if observations were made on the transit of the sun across the meridian at points separated by 15° of longitude, it would be found that the time of transit at two such points would differ by 1 hour. If the separation of the points of observation were decreased, the difference in time would be decreased in the same proportion. These times would all be true local times, using the transit of the sun across the meridian as a standard.

The need of a uniform time began to be felt in the United States about 1870, and the railroads gradually adopted a system for use on their roads specifying definite important centers or junction points at which changes of one hour should be made. As means of communication still further developed, it became apparent that some system of international time must be established.

International congress held in 1884.

In 1884 an international congress was called in Washington to consider the subject of a world standard of time. The world was divided into zones, each covering 15° of longitude, the time for each zone being that of the meridian passing through its approximate center and the time in adjacent zones differing by one hour. The meridian passing through the observatory at Greenwich, England, was chosen as the zero meridian from which all time should be reckoned.

Although there was no definite agreement as to the adoption of this time by the different nations, the plan was gradually accepted. Some countries, however, make use of the half-hour variation instead of the full hour because it more nearly agrees with local time. Thus New Zealand time is 11½ hours faster than Greenwich time, Hawaiian time is 11½ hours slower than Greenwich time, and Indian time is 5½ hours faster than Greenwich time.

A few countries have adopted the local time of some important city as a standard for the country. Netherlands uses the time of Amsterdam, which is 19 minutes and 32 seconds faster than Greenwich; Newfoundland uses St. Johns time, which is 3 hours and 31 minutes slower than Greenwich; and Calcutta uses its own local time, which is 5 hours, 53 minutes, and 21 seconds faster than Greenwich, instead of the standard Indian time, 5½ hours faster than Greenwich. Russia, Siberia, and Mexico have recently been divided into time zones in conformity with the International Standard time.

Zone map of the world.

The alternate time zones of the world are shown on a map published by the Hydrographic Office of the Navy Department, in pink and blue; the half-hour zones are shown in purple, the countries using the local time of some city as a standard are shown in yellow, and those places having no standard time are shown in gray. Among these latter are most of China, Persia, and Greenland.

The United States, although using the system since 1884, did not legalize it until March 19, 1918, when Congress directed the Interstate Commerce Commission to establish limits for the various time zones in this country. Changes in these boundaries have been made from time to time, in order that the time changes may occur at such points as to result in a minimum of inconvenience. The division lines are not straight, but largely follow the railroads and pass through important cities and junction points. The United States is divided into four standard time zones, each approximately 15° of longitude in width. All places in each zone use, instead of their own local time, the time counted from the transit of the "mean sun" across the meridian which passes through the approximate center of that zone.

Designation of zones.

These time zones are designated as eastern, central, mountain, and Pacific, and the time in these zones is reckoned from the seventy-fifth, ninetieth, one hundred and fifth, and one hundred and twentieth meridians west of Greenwich, respectively. The time in the various zones is slower than Greenwich time by 5, 6, 7, and 8 hours, respectively.

The question of changing from the time of one time zone to that of an adjacent zone arises in practice largely in the operation of railroads. Because of the inconvenience of changing the time by the necessary amount of one hour at every point where a railroad crosses one of these boundary lines, the more convenient practice has usually been followed of making the change at some terminal or division point on the road, or at some junction point. The result is that practically the boundaries of the time zones are defined by the lines connecting these points of railroad time changes. Because of the location of these railroad junctions or terminals the resulting lines are rather irregular. A map is now being printed by the Bureau of Standards showing these boundary lines with extensions into Canada and Mexico. This map is expected to be ready for publication within the near future.

The spread of radio and other means of rapid communication makes evident the importance of the International Time Zone System.

WHAT IS WRITING INK?

Review of Writing Inks in Relation to Federal Specifications; Author Tells Why Some Inks Are Good and Others Are Not

By C. E. Waters, *National Bureau of Standards*

Without writing ink, typewriter ribbons, and carbon paper the modern office would have to get along with pencils. One is compelled to wonder what would be selected as the butt for complaints, because anybody can get a satisfactory pencil without much difficulty. Twenty-five years of close contact with the analysis and testing of writing inks and a shorter acquaintance with typewriter ribbons and carbon paper have shown that these essential office supplies never quite suit the user.

Complaint is made that the ink is too corrosive, too thick and gummy; the ribbons either give blurred writing or they are unevenly inked and the fabric cuts through in no time; the carbon paper gives poor copies, smudges badly, and does not last long enough. Is there justification for these complaints?

What is writing ink?

Nowadays most of the writing inks are of the blue-black kind. They are, or should be, clear solutions, and should not quickly become turbid and deposit sediment. The writing is blue at first, but in a few days turns nearly jet black. The blue color is due to a dye, which must be in the ink because without it the fresh writing would be of a pale, faded-looking color. The change to black is caused by the action of atmospheric oxygen, which converts the easily soluble, weakly colored ferrous gallotannate and insoluble, black ferric gallotannate. When writing which has become black is immersed in water, the dye will bleed out, together with whatever gallotannate is not firmly attached to the paper. This soaking ought not wash out all of the writing nor so blur it that it becomes illegible.

When a bottle of ink is kept for a long time it becomes first cloudy and then deposits a thick, gummy sediment, which is largely the insoluble ferric gallotannate. If the ink is hermetically sealed in a glass bulb so that oxygen can not get to it, there will be no sediment for years; but a cork stopper is not really air-tight, and oxygen gradually gets into the ink. In order to slow down the oxidation and to keep the black compound as long as possible from precipitating, and thus delay the formation of sediment, the ink must contain some free acid, usually sulphuric but sometimes hydrochloric.

Early writing fluids.

Our ancestors used iron gallotannate ink for about 700 years before discovering the advantage of having in it a little free acid. What they had was aged before use and was a muddy suspension of fine particles of the iron compound in water. To keep these particles from settling to the bottom too fast, and to hold them to the paper, a small quantity of a suitable gum was dissolved in the ink. Clear inks of the present-day type were first made in the early part of the last century. As quill pens were the writing implements in those days, this modern kind of ink had to wait a few decades before "it corrodes the pen" could become the favorite complaint about it. Nowadays any incrustation of dried-up ink on the pen, as well as any roughness of the point caused by the solvent action of the acid, is called corrosion.

The post-office lobby pen is held up as a horrible example of what a corrosive ink can do, though the condition of the pen is a reflection upon the users rather than the fault of the ink. If the pens were wiped on a blotter after use there would be no complaints about corrosion. The stationer and the druggist sell almost identical ink, though theirs may contain a little more acid than the ink in the lobby. The same ink put up in a different bottle and appropriately labeled becomes fountain-pen ink. What makes this so much better than the ink furnished by Uncle Sam? We think it so because we think it so.

How much acid should be in writing ink is a matter for dispute. Both manufacturer and user want the ink to stay clear as long as possible, but not to have it so acid that it will roughen steel pens. The Federal specifications for record and copying ink (No. 163) and for writing ink (No. 164), represent attempts to compromise between excessive sedimentation and too much corrosiveness.

Permanence of writing ink.

The experience of centuries has shown that iron gallotannate inks have excellent permanence, though they are by no means perfect in that respect. The writing will eventually fade, especially if it is much exposed to bright light and to dampness, but as long as the paper holds together it is possible to partially restore the writing. The gallic and tannic acids in the ink may be completely oxidized to water and carbon dioxide long after the dye has disappeared, but the iron will remain behind as streaks of rusty iron oxide. By appropriate chemical treatment it is possible to change these pale particles of iron oxide into more intensely colored compounds of iron.

Most written matter is not worth keeping for many years so it suffices to have ink which is of good color and easy to use. Records should be written with ink of such a concentration that there will be plenty of black iron gallotannate on the paper. The more of this, the slower the fading and the better the chance of restoring the writing by chemical treatment. That is why the record and copying ink of the specification is about twice as concentrated as the writing ink. It is less fluid than the writing ink, contains more acid, dissolves steel pens, and has in it more solid matter which forms deposits in inkwells and fountain pens that are not cleaned often enough; yet it has been voted an excellent ink by users who did not know all these things about it. The experiment has been tried.

Other kinds of writing ink.

It is possible to make writing ink with other metals than iron, but they have not come into general use. For making colored inks dyes are employed, the one conspicuous exception being the use of soluble prussian blue in the so-called acid-proof inks. This coloring matter, which is not a dye, is not attacked by acids which will not also easily destroy paper, but it is decomposed by alkaline solutions. Soap and water diligently applied will usually erase writing with prussian blue. Because this color does not turn black, and bright blue writing is not popular, a black dye is sometimes dissolved along with the prussian blue. This combination makes a dark blue ink of surprising permanence.

The convenience of ink powders and tablets is a strong point in their favor, but as they are composed of dye they are not acceptable to the Government for making record ink. The writing does not quickly fade nor can it be washed out easily, but when it goes nothing is left behind that can be colored by chemical treatment. The specification for writing ink mentions powders and tablets in a spirit of optimism, hoping that somebody will succeed in making a mixture that meets all of the requirements. The great obstacle in the way to success is the necessity of having free acid in the ink. No satisfactory substitute for sulphuric or hydrochloric acid has been found. There is no such difficulty with concentrated ink, which is a commercial success when properly made.

Blue-black and red inks are tested in comparison with standard inks made according to formulas given in the respective specifications. Delivery samples must be as good in every essential as the standard, though the specifications do not require the manufacturer to use the pure materials called for by the formulas. The wording on this point is perfectly clear, yet it is often misread.

From one point of view, carbon is the best ink-making material because no amount of exposure to light and no treatment with chemicals, short of destroying the paper, will bleach or dissolve it. In fact, its weakness is that it can not be dissolved, and yield a solution which can be used as ink. Yet there are carbon inks. They are suspensions of carbon in water that contains other substances to keep the black from rapidly settling out, and to hold it to the paper. Black drawing ink is the best known of this kind, but there are a few manufacturers who make carbon writing ink.

(In a forthcoming issue of the Commercial Standards Monthly the author will present the second part of his article, which will deal with typewriter ribbons.)

A. S. T. M. CONDUCTING RESEARCH ON COTTON

New Test for Tear Resistance Has Been Developed

The subcommittee on cotton of the American Society for Testing Materials committee on textile materials has been conducting important research work on the factors influencing the strength and length of cotton fibers, according to the society. Preliminary work on strength testing methods has been conducted and the committee has expressed the belief that the present tentative methods of testing cotton fibers should be withdrawn as it is further believed the work in progress will lead to more acceptable procedures.

A new test for tear resistance has been developed and will be added to the tentative test methods for certain light and medium cotton fabrics. Revisions in the standard tolerances and test methods for tire fabrics other than cord fabrics and also for cord tire fabrics, have been agreed upon for immediate adoption to conform with the standard practices now followed by the tire and fabric manufacturers. Specifications for electrical cotton tape are also being studied and experiments with new type jaws used in testing hose and belt duck are being conducted.

The subcommittee on rayon is cooperating with the Bureau Internationale pour la Standardization des Fibres Artificielles, Basle, Switzerland, looking toward the harmonization of the methods of testing rayon. This section is also planning a study of rayon fabrics.

The subcommittee on methods and machines has developed, in cooperation with the other subcommittees, revisions in the tentative methods for identification of textile fibers, a method of measuring tear resistance as a tentative revision of the standard method of testing woven textile fabrics, and a tentative revision of the standard specifications for textile testing machines involving the use of pins in the jaws of textile machines to bring the jaws into alignment at the time of inserting the test specimen. This section is also making a comprehensive study of abrasion of textiles.

INDIAN RAILWAY STANDARDS

Railway Board Has Approved 132 Specifications to Date

A few years ago the Indian Railway Board set up a stores standardization committee in connection with the reorganization of the stores department of the Indian State Railways. Since its inception, according to a dispatch received recently from Charles B. Spofford, jr., American trade commisisoner at Calcutta, India, the committee has held three meetings and 132 specifications have been drafted and approved by the railway board. These specifications cover a large proportion of the items in common use by Indian railways.

The specifications, designated as Indian railway standard specifications, will be issued in pamphlet or loose-leaf form, indexed and dated, and catalogues will be issued periodically to insure that railways retain up-to-date publications only. The committee's recommendations have been incorporated in the railway board's specifications for rolling stock.

According to the dispatch from the American trade commissioner, the lack of standard designs and specifiations for automatic air-brake fittings has caused considerable inconvenience. The subject is under investigation at present and it is expected that the necessary drawings and specifications will be completed during 1930.

SOME STANDARDIZATION RESEARCH AFFECTING LAND, SEA, AND AIR TRANSPORTATION

Development and Improvement of Devices Result from Research Activities of National Bureau of Standards

By Henry D. Hubbard, *National Bureau of Standards*

It is said that "man can only move things." He does far more. He controls such movement in direction, force, and time; whether directing a radiobeacon, sending a flood of light on a distant ship, speeding a projectile to a target on the horizon, routing a cargo to China.

By land, sea, and air, transport is a vastly complex enterprise for moving things, energy, persons, ideas, or scenes—interlocking, as in train schedules; seasonal, as on icebound waters, or shooting lumber on freshet stream; elsewhere independent, as in pleasure and sport craft—plane, boat, car. With its new three-dimensional freedom, transport exhibits interesting types of standards.

Science is so fertile in useful application that, under the Department of Commerce, the National Bureau of Standards early became active in research to promote progress in transport—touching rails, bridges, signals, aircraft, motors, brakes, elevators, safety codes, control instruments, headlights, radiobeacons, balloon fabric, telephony, track scales, traffic control, and the like. In these and many other subjects the bureau cooperates with Government agencies, transportation experts, or industry.

Research in transport.

Research and standardization touch all aspects of transport—ways, aids, timing, the car, the power which drives it and the brakes which check it, the signals and controls that guide it, the pilot in command, the cargo, time and rate schedules—a thousand and one items from the standard transverse profile of a 4-track roadbed to the controlled climate in the latest parlor coaches. Of these the bureau engages in researches for which its special facilities are adapted or which are most urgently pressing for investigation.

The Bureau of Standards, by its research and testing, aids transport at vital points; for example, materials of construction. To stimulate interest and give needed data, the bureau compiled and published the foreign specifications for railway materials. Its early investigation of structural columns gave a classic reference basis for railroad bridge engineering. The bureau's later tests of bridge members, which confirmed the adequacy of strength built into structures, such as the Hudson River and Delaware River Bridges, gave valuable data on load-carrying capacity and yield. Such bridges are important links in highways and railways.

The bureau has made many studies on railway materials and on the causes of accidents. When alarmists used to say that the wreck was the first real test of the failed rail, the bureau, with other agencies, were devising and demonstrating ways to improve the quality of rail steel and steel rails.

Pyrometer used in tests.

During the experimental researches on steel rails and how to make them safe, the bureau used the pyrometer to measure temperatures of steel rails passing through the rolls, thus opening a new era in rail production. Its report on sink-head ingots and the Hadfield method showed that by standardized procedure sound rails could be produced. It found that the right finishing temperature in rail making was vital to good quality. At that time rails were being finished at 1,615° F., or over, although a critical temperature was known to exist at 1,300° F. The bureau then recommended rolling to lower temperatures nearer this critical point.

Advance in the welding art recently made is evident from the bureau tests of welded street railway rails subjected to impact and tensile tests. Many of the rails broke not at the weld but elsewhere. Tests of welded joints in steel tubing are referred to later

The bureau duplicated the failure of cast-iron car wheels found to be caused by unequal heating and expansion along the wheel radius on prolonged braking—a beautiful example of scientific detective work, giving data on cast-iron wheel behavior and information of service in the design of improved car wheels.

Specifications for aircraft materials.

During the World War the bureau joined in preparing international specifications for aircraft materials to assure the use of effective materials as to safety and durability. Many aircraft materials researches might be recited. The bureau published a complete monograph on duralumin and other light alloys, making accessible new and compiled data on such alloys. To prevent its corrosion (a real hazard) the bureau recommended coating it with pure aluminum. This now adds life to that remarkable alloy which has had such revolutionary applications in aircraft construction.

In designing aircraft the engineer must know the properties of his materials. The bureau is besought for accurate numerical data on such materials. Its researches include, among others, an experimental check on the dura umin girders of the airship *Shenandoah* to make sure of their strength; further study after this airship was wrecked to detect any possible weakening during service showed no decrease in strength; experimental development of test methods and devices for measuring the repeated stress characteristics furnished specific data for designers; tests in tension and compression combined both for sheet and tubing of duralumin; investigation of the strength of welded joints of steel tubing to determine whether airworthiness certification should be accorded by the Department of Commerce; experimental findings showing conditions necessary for strong welded joints.

Metals subject to alternating stresses are tested in small strips supported on air jets at nodal points and by air jets made to bend back and forth 450 times a second, or less, giving for some specimens hundreds of millions of cycles of bending. From such tests may be determined the fatigue limits or conditions which the designer must have in mind. Much work on materials is done in cooperation with the National Advisory Committee for Aeronautics, which will publish the results on welding of steel-tubing joints.

Sponsor preparation of code.

The bureau was sponsor for the preparation of the aeronautical code for aircraft construction, maintenance of flying fields, and the operation of aircraft. In this work 33 engineers and aircraft technicians cooperated, devoting four years to the work. In the bureau's wind tunnels the lift and drift of airplane models and parts are measured to ascertain the effect of shape on air resistance and behavior. Work is in active progress to standardize the conditions of operation and experimentation in wind tunnels.

A recent success was the bureau's research which now reduces the thunderous roar in an airplane cabin to the relative quiet of a Pullman coach, so that ordinary conversation is now made possible with the construction recommended and demonstrated in actual plane construction.

Aviation requires radio not only for the radio-beacon, but to maintain two-way telephony with the ground, to receive and send messages concerning flight conditions as affected by the weather. Successful radio rests on accurate measurement and maintenance of radio-frequency (cycles per second). The bureau aids by broadcast programs of frequency signals standardized with high accuracy. These permit local standardization of wave meters everywhere within range by direct comparison with the official signals.

The bureau's altitude laboratory, with its controlled climate, variable at will (the first of its kind) was built to test motors and predict their performance at all altitudes encountered in flight. The low pressure and temperature of the upper air are produced in an air-tight chamber to duplicate the conditions at all flight altitudes. The bureau's research program has been comprehensive. Here were studied motor characteristics with respect to lubrication, carburetion, ignition, and power production. The volume of results on the supercharger (forced-air feed) gave this device a firm hold in aircraft motors.

Its great success, adding 50 per cent to the power available for high flight, led to its adoption in racing cars. Here the results were so good that their use in ordinary automobiles is forecast. Before an airship leaves the ground the presumptive performance can here be measured for the motors at all expected flight levels. In motor research fundamentals were attacked experimentally. When the spark plug was found to be the weak point which limited the air-life of an aircraft motor, the bureau focussed on the problem.

Research on motors.

Intensive research was directed on all phases of design, construction, and operation of the spark plug. A new formula for spark-plug porcelain was devised to avoid cracking under the temperature changes in service. The results at once entered commercial practice to the permanent gain of aviation.

The Bureau also determined the best fuel-to-air ratio for motors, the best compression ratio, how the explosion proceeds, and what can be learned of interest in motor design. Bureau research showed that only a tenth or less of the fuel energy actually reaches the driving wheels, and suggested means to increase the efficiency. Novel methods were applied. These have been adopted by the industry.

The Bureau of Standards makes the official tests of commercial airplane motors—an endurance run of 50 hours, as required for the issuance of airworthiness certificates by the Department of Commerce. Improved power plant design of new types of motors has resulted from the tests, technical criticism, and advice to the makers of aircraft power plants.

PROGRESS IN SAFEGUARDING INDUSTRIAL WORKERS FROM ACCIDENTS

Employers Converted to Principle of Conserving Efficiency of Labor, State Official Reports

Managers of industry in earlier days paid little attention to the safety conditions of their workers, says F. M. Wilcox, chairman of the Industrial Commission of Wisconsin, in a recent issue of the United States Daily. The few existing safety directors were given little consideration by employers and no cooperation by employees. They were merely tolerated, and were looked upon as strange sorts of individuals. And in those days few statistics were kept of plant accidents or the degree of disability.

Men and machinery were of the same class. They were considered by those in command as instruments of production. In the old system, manufacturers exercised special care as to the condition of a machine. So long as it was efficiently productive it remained in use. Likewise, the worker's service was engaged only so long as he registered normal production.

Too little consideration had been paid to the preservation of that human instrument at its highest efficiency. Realizing that this attitude retarded civilization, that to progress there must be increasing recognition of the prime importance of human relations, some steps were taken toward their advancement.

The establishment of workers' compensation laws aided in the development of accident prevention, and assisted in promoting the employees' general welfare. It also created among the employers a personal interest in safety conditions and processes in the plant. Today records of some of their large plant units, rated as among the more hazardous types of machinery, reveal that they have operated for many years without a single lost-time accident. They have learned the necessity for cooperation among employer and employee, the regard and enforcement of protective rules and practices, and the continuous application of safety devices and mechanical guards.

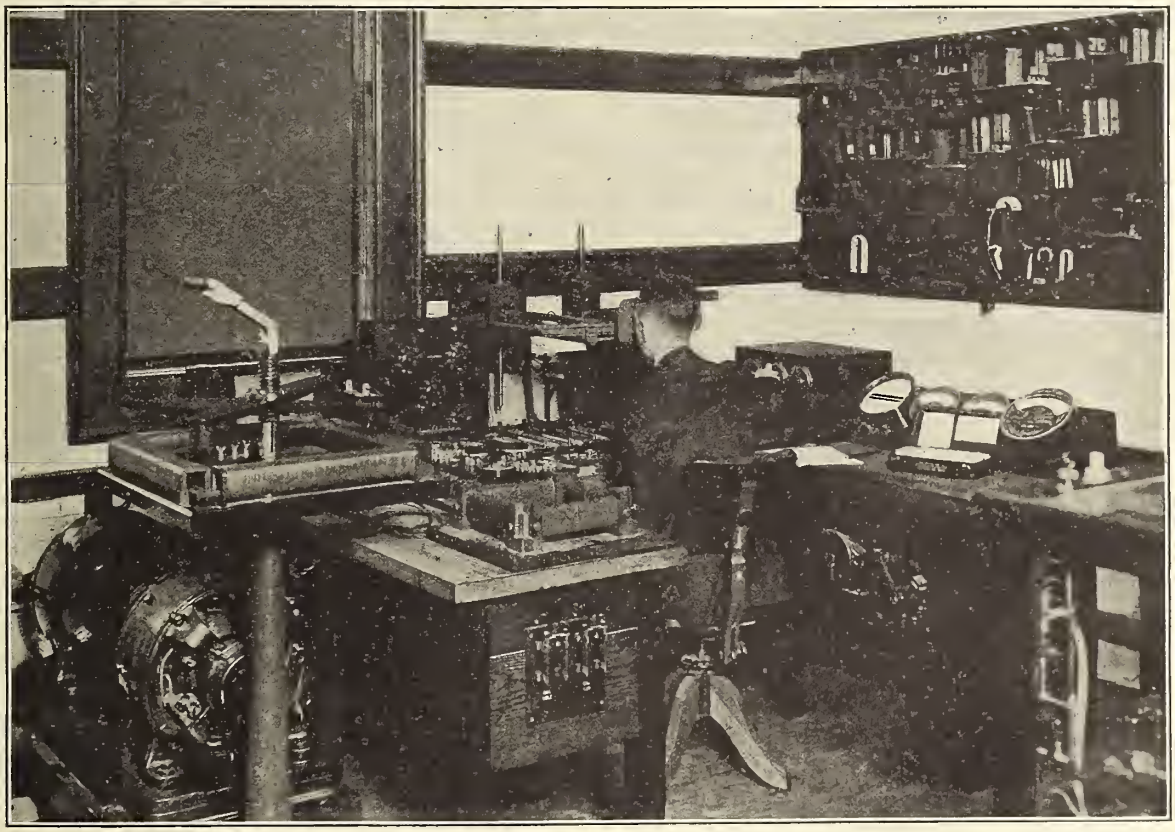
MATERIALS USED IN THE ELECTRICAL INDUSTRY

Research Conducted in Bureau of Standards on Insulators, Conductors, and Magnetic Materials

By E. C. Crittenden, *National Bureau of Standards*

Electric power is essential and all pervasive in our modern life. Electric energy from central stations not only serves 19,000,000 homes in this country, but supplies the driving force for half our industries, and its share of the industrial load is rapidly increasing.

Nearly a billion dollars a year goes into the enlargement and improvement of facilities for providing this service. The central station industry is therefore a large buyer and user of machinery and materials.



Magnetic testing apparatus to determine the loss of energy in steel when used in an alternating magnetic field

Its responsibilities for rendering satisfactory service also give it an active interest in the equipment used by its customers and in the materials and methods used in making such equipment.

Furthermore the leaders of this industry have recognized that its rapid practical development in our generation is based upon the knowledge accumulated by workers of the past; believing that further development will likewise depend upon systematic study of its problems, they have supported scientific research to supplement practical experience.

Since the electrical power industry has such broad interests its contacts with the Bureau of Standards are correspondingly varied.

Examples of work.

As examples of current work affecting the power industry directly, although not classed as electrical, one may cite studies of the properties of steam, the behavior of metals at high temperatures, the performance of bearings and lubricants, and the corrosion of metals under various conditions. The electrical industry is, however, specially concerned with materials of three kinds—that is, electrical conductors, electrical insulators, and magnetic materials.

Standardization of conductors.

Practically the only electrical conductors used are copper and aluminum. The bureau has made exhaustive investigations of the properties of these materials, and compilations of data on them have been issued as Circulars Nos. 73 and 346, entitled, respectively, "Copper" and "Light Metals and Alloys."

For copper as commercially supplied, a standard value of conductivity, based largely upon the bureau's results, was adopted some years ago by the International Electrotechnical Commission, and is now used throughout the world. With regard to aluminum, negotiations for a world-wide standard have not been concluded, but a standard conductivity based on the

bureau's values has been adopted by the American Institute of Electrical Engineers and approved by the American Standards Association for use in this country.

Conductivity of materials and methods of measuring it are now so well standardized that the chief service required of the bureau is to check the accuracy of tests made in commercial practice. This is done, on request, by making precise measurements on standard rods or sample wires for comparison with the results obtained at industrial plants and testing laboratories.

Magnetic materials not standardized.

Magnetic materials (iron and steel) are not susceptible of standardization in the sense that conductors are, because they vary widely in composition and because their properties are affected so much by heat treatment and mechanical working. The bureau's researches on these materials have, therefore, been largely directed toward the establishment of reliable methods for finding what the magnetic characteristics of a given lot of material are. Through cooperation with the American Society for Testing Materials, standard methods of measurement have been established.

As in the case of conductors, tests of magnetic materials are made by the bureau as a check on those made in commercial laboratories. A description of the methods used has been published in a bureau circular on "Magnetic Testing."

Research on electrical insulating materials.

Electrical insulating materials are even more diverse and uncertain in character than magnetic materials. They include solids, liquids, and even gases, and the properties desired depend largely on the place and the purpose for which the insulator is intended.

Standard methods of testing have been established for some properties, especially "dielectric strength" (the ability to withstand high voltages), but the bureau's work on insulators is largely research directed toward finding out why the materials behave as they do, since this is the first step toward making them better. This research at present consists chiefly of a study of rubber and rubber compounds and of very pure liquid insulating materials. The latter project is supported directly by a group of central station companies on the ground that the knowledge gained may eventually help in explaining what actually happens in practical insulating materials when they deteriorate with age and fail in service.

In the further development of electrical power the improvement of insulators is a key problem. Consequently, various technical and commercial organizations have committees working on this subject, and the bureau is represented on many of them.

As a special problem the bureau has recently made a comparison of American mica with the imported material now generally used. This shows that the foreign product has no advantage in dielectric strength. Measurements of other properties are being made. It appears probable that the only advantage of the imported mica are better preparation and established reputation, so that reliable technical data may give the foundation for a new American industry.

PUBLICATION ON BISMUTH

Bureau of Standards Publication on Bismuth Suggests Possible New Uses for Product Which Is Now Largely a Waste Product

The three chemical elements, arsenic, antimony, and bismuth, form a subgroup of the periodic system in which bismuth is the heaviest element, has the highest atomic weight, and in many respects is the most "metallic." Bismuth can not be classed as an abundant element, although there is annually a very considerable production, chiefly as a by-product in the refining of other metals. Nevertheless, bismuth has very few uses at present. The by-product production of large quantities of a relatively useless metal is obviously a challenge to metallurgical research.

In a new publication of the Bureau of Standards, Circular No. 382, the metallurgical literature of bismuth is reviewed and existing information, particularly concerning the properties and the relatively few uses of bismuth, is compiled and classified.

The occurrence and distribution of bismuth, its recovery from ores and from by-products in the purification of other metals, methods of refining, statistics of production and price ranges are all considered briefly. Physical properties and uses are discussed, as well as nearly 30 binary alloy systems containing bismuth. The low melting points of several of these alloys are of particular interest, several of them melting at temperatures considerably below the boiling point of water. A selected and classified bibliography is appended.

Copies of this publication may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10 cents each.

PROPOSE SIMPLIFICATION FOR TERRY TOWELS

A simplification program of wide interest is one recently proposed for terry towels, generally known as Turkish towels. Towels of this description are made in a wide variety of widths and lengths, and manufacturers believe that many sizes could be eliminated with benefit to all concerned.

Manufacturers representing 90 per cent of production of terry towels and representatives of the Cotton Textile Institute and of the division of simplified practice of the Bureau of Standards, met at Pinehurst, N. C., on May 6, in conjunction with the annual meeting of the American Cotton Manufacturers Association, to discuss the need for simplification and to take the initial steps in the development of a simplified schedule of sizes. The conference was of the unanimous opinion that the simplification program should be limited to widths and lengths of terry towels. A committee was appointed to cooperate with the Cotton Textile Institute and the division of simplified practice in collecting the necessary information for preparing the schedule which will be presented for approval by the industry.

RAILROADS MAKE WIDE USE OF STANDARDIZATION

Roads Find it Promotes Efficiency, Economy, and Safety, and Enables Them to Reduce Inventories; Carriers Continually Engaged in Research

In the early days of the American railroads, cars were confined to the roads for which they were built and to which they belonged, and in their design each railroad was a law unto itself. The inconvenience of transshipping freight when carried long distances soon made it necessary to run cars over more roads than one, and, as the demand for carrying freight further without breaking bulk increased, some improvement was necessary in order to carry it without unloading, and as rapidly as possible.

It was soon found that difficulties were constantly occurring in regard to the repairs of cars moved over other roads, and that they were often delayed when far away from home, by not having the right kind of materials on hand to replace broken parts. The master car builders of the various railroads formed an organization, one of the objects of which was to standardize parts of cars which are apt to fail in regular service, thus making it possible for cars to be repaired whenever any failure of part occurred, without any undue delay to the car or to the shipment. This work is now carried on by the American Railway Association.

Standardization of parts.

At present the various parts of cars are so well standardized that the same wheels, axles, couplers, journal bearings, brake shoes, brake heads, and a multitude of other parts are common to all freight cars, and the delays to cars on account of awaiting material from the car owner to make repairs, are reduced to a minimum.

As an indication of what has been accomplished in the direction of standardization of detailed parts of cars, the following is presented:

	1882	1926	
Axles ---------- different kinds --	56	1	(6 different sizes.)
Journal boxes ---------- do ----	58	1	(6 different sizes.)
Couplers ---------- do ----	26	1	(2 different sizes.)
Brake shoes ---------- do ----	20	1	
Brake heads ---------- do ----	27	1	

Adoption of safety equipment.

The parts enumerated above are only a few of those used in the repairs of cars, but if all were named, it would increase the list to enormous proportions. Among the more important developments made by the association may be mentioned the adoption, in 1887, of the automatic coupler for cars, thus doing away with the link and pin coupler and the necessity for going between cars to couple them together. At the present time the automatic coupler is the universal standard of all railroads in the country.

Another important development was the adoption in 1888 of the automatic air brake as the standard of the association. To-day practically every car in the country is equipped with this device. Following its adoption, a code of instructions for the proper operation of the air brake was prepared and generally distributed among railway employees.

Standardization of complete cars.

Since all of these parts of cars have been standardized, the next move was the standardization of the complete car. The American Railway Association has had committees on standard cars for about 12 years. The work of these committees was utilized in designing the 100,000 cars built by the United States Railroad Administration, and continuing that work the association has adopted standard box cars of single-sheathed, steel-framed design. Many thousands of these cars have been constructed, and practically all cars of this type being ordered or contemplated at the present time are to this design.

The American Railway Association has also prepared designs for an all-steel box car, of which many thousands have been built. Designs for double-sheathed box cars having wood outside sheathing and complete steel frame have likewise been adopted and a considerable number of such cars have been built. Designs have been adopted covering 50 and 70 ton hopper cars of all-steel construction. Although these designs were adopted only about a year ago, several thousand cars have already been built. A standard design of steel-frame stock cars has been adopted and a considerable number of such cars have been built.

Each of these designs already prepared or in the process of preparation utilizes to the utmost degree the same parts and details of construction. In so far as the ordinary parts common to all cars are concerned, these standards are the same as are now used on existing cars; viz, wheels, axles, couplers, air brakes, hand brakes, brake beams, brake shoes, etc. It is expected that, through the normal retirement and purchase of equipment, within the next few years, a large portion of the car equipment of the country will be standardized. It is this high degree of standardization in equipment reached by the railroads that, in a large measure, is making possible the present splendid performance in the expeditious handling of freight for the American public.

Loading of commodities.

In 1896 the railroads adopted a code of rules governing the loading of lumber, logs, stones, etc., and the loading and carrying of structural materials, plates, rails, girders, etc., on open cars. These rules have been revised annually to take care of additional commodities and to take advantage of improvements in cars, loading methods, etc.

At the present time there are rules governing the loading of lumber and forest products, steel and steel mill products, mining cars, engines, boilers, machinery, derricks, concrete culvert pipes, brick, stone, tile, automobiles, trailers, and tractors. These rules have been adopted by the hearty cooperation and assistance of the shippers, and conferences are held annually with each group of shippers affected. This standardization of practice has been instrumental in the expeditious handling of freight from shipper to consignee without damage to the commodities carried or the cars used.

Tank-car specifications.

No other country in the world ships liquid commodities in bulk to anything like the extent of this

practice in the United States and Canada. Many of the commodities handled in tank cars by the railroads are very dangerous, such as gasoline, acids, liquified chlorine, and sulphur dioxide. In 1903 specifications for tank cars were adopted, and at the present time all tank cars used and constructed in this country are in accordance with these specifications as revised from time to time. By the use of these specifications, together with the regulations of the Bureau of Explosives and the Interstate Commerce Commission governing the handling of explosives and dangerous commodities, a tremendous volume of liquid freight is handled safely, cheaply, and expeditiously. During the past year, a committee in charge of these specifications has prepared designs for tank cars for the shipment of the following additional commodities in bulk: Ethyl chloride, propane, dinitro-chloro-benzol, sulphur dioxide, and anhydrous ammonia.

This committee is continually arranging for service tests of various devices used on tank cars where it is thought the devices offered show promise, such arrangements being made with the approval of the Interstate Commerce Commission. The practice of shipping commodities in bulk with resultant savings to industries and the public is becoming more prevalent each year, and the association is called upon continually to provide specifications for the shipment of new commodities in this manner.

Research.

The railroads, in order to provide transportation which will be adequate to the needs of the country at the least expense and with the greatest safety, are continually engaged in research in connection with the various phases of transportation. A large portion of this research is cooperative, and under the direction of the American Railway Association. The majority of the railroads, and all larger ones, maintain laboratories, and engineers of tests are continually making researches on their own account, but the results of such research are given to all of the railroads through the committees of the association.

At the present time a test of air brakes is being conducted under the direction of, and at the expense of, the American Railway Association. This investigation is in the interest of promoting safety of the public and commodities handled by the railroads.

Research has also been undertaken on the subject of draft gears which absorb the shocks between cars in trains. A test machine has been designed and is located at Purdue University, where a complete program of research is being carried out to develop the most satisfactory draft gear, which will give a maximum of protection to the railroad cars and commodities carried.

The question of train line connectors which will automatically couple the air, steam, and signal hose between cars without the necessity of workmen going between the cars for this purpose is also being studied by a special research organization of the association. Other committees of the association are investigating in various railroad laboratories, materials for use in construction and repair of railway equipment to insure the greatest safety; autogenous welding; and wheels for cars and locomotives.

Realizing that the steam locomotive represents a large investment in money and should be utilized to the utmost, the association has a joint committee making a very thorough study of this problem. Surveys are being made on the important railroads to determine what practices will insure the maximum utilization of such locomotives and thus obtain the most from the money invested. The preliminary reports from this committee have already had a very pronounced effect on the operation of the railroads in the United States and Canada.

SPECIFICATIONS FOR STEEL

American Society for Testing Materials Proposes Several Revisions

The A. S. T. M. committee on steel has specifications for an intermediate grade of structural steel under development, and revisions of the requirement for rivets of the structural steel specifications are under consideration. Proposed specifications for austentic steel castings were approved to be recommended for publication as tentative. Specifications were received for open-hearth iron plates of flange quality for boilers. Consideration will be given to the development of specifications for alloy-steel boiler plate as well as to increasing the tensile requirements of boiler rivet steel.

The committee is giving consideration to the development of specifications for alloy-steel castings for high-temperature service. Revisions of the standard specifications for alloy-steel bolting material for high-temperature service are in prospect in respect to the requirements for material for the larger sizes. Specifications are now in process of development for various types of pipe that are not at present covered in the American Society for Testing Materials specifications, including fusion and resistance-welded pipe, hammer-welded pipe, electric arc-welded pipe, and fabricated and riveted pipe of all kinds.

The subcommittee on steel for welding, of this committee, rather than to develop new specifications for steel for welding, has presented a list of current specifications of the society covering material that is considered suitable for fusion welding including the various structural steel specifications, the boiler steel specifications, and the permanent specifications for plates for forge welding.

MASONRY OPENING SIZES

The initial efforts of the committee on masonry opening sizes will be confined to the development of masonry opening sizes for metal windows, as a result of the action taken at a meeting of this committee held on May 19 at the Bureau of Standards. The meeting approved the appointment of a subcommittee, composed of manufacturers of steel and copper and bronze windows, to draft a tentative simplified practice recommendation covering masonry openings for metal windows. This will be presented to a general conference of all interested elements of the industry for approval. The division of simplified practice of the bureau will assist the committee in calling this conference.

STANDARDIZATION BRIEFS

The thirty-third annual meeting of the American Society for Testing Materials will be held at Chalfonte-Haddon Hall, Atlantic City, N. J., June 23 to 27. The A. S. T. M. bulletin states that a well-rounded program is provided with a number of miscellaneous materials represented. According to the bulletin, in recent years the A. S. T. M. committee on correlation of research has reported upon the current research projects being carried on by the several standing committees. Similarly, a committee on standards has been organized, one of the functions of which is to review the standardization activities of the society. It is planned that these reviews be made yearly after the annual meeting, so as to include in them whatever actions are taken at the meeting, in respect to standards or in the initiation of new research projects. The results of these reviews will be issued early in the fall of each year.

The Philippine Hardwood Export Association has officially adopted the standard grading rules of the National Hardwood Lumber Association of the United States, according to information received from G. C. Howard, American trade commissioner at Manila.

Discussion of drastic revisions designed to simplify and standardize the Nation's criminal code featured the meeting of the American Institute of Law in Washington on May 9. It was stated during the conference that conflicting codes of the various States and complexities of existing laws made it difficult for courts to function efficiently and swiftly.

The work of the Army and Navy in standardization of aircraft instruments, accessories, and power-plant items, has resulted in their becoming recognized authorities and the standards adopted are being used to an increasing extent by commercial aviation interest, according to Rear Admiral William A. Moffett, chief of the Bureau of Aeronautics, Navy Department. Several years ago the Army and Navy recognized the need for standardization within the aeronautical industry, particularly on material specifications, the result being an annual conference. The need for standardization has been so urgent that the conferences have extended their standardization activities to include not only material specifications, but standards for instruments, accessories, and power-plant items.

It was stated at the annual meeting of the National Committee on Wood Utilization, held at the Department of Commerce on May 2, that investigations and tests are being made to develop more concrete and definite information regarding fire retardant processes. The new method of testing fire retardant wood developed by the Forest Products Laboratory has opened the way toward establishing standard tests of various fire retardant chemicals.

Proposed metric spark-plugs for automobile specifications have been recommended to the standards committee of the Society of Automotive Engineers for approval as an S. A. E. standard. Several changes have been recommended by the lighting division of the S. A. E. in the automobile headlighting specifications of the society. These proposed changes are subject to final approval by letter-ballot of the lighting division.

Distribution of the new standard-newspaper data form, prepared by the American Association of Advertising Agencies, began on May 1, according to the magazine Editor and Publisher—The Fourth Estate. The standard form is designed to present a complete picture of the kind of newspaper published, including the history and management of the publication, the editorial policy, news services, and syndicate material used, departments published and the editors in charge, respective amounts of news and advertising matter carried, merchandizing and promotion work done, and radio station, if any.

The American Gear Manufacturers' Association at its fourteenth annual meeting, held in Cincinnati, Ohio, on May 1 to 3, accepted the report of the worm-gear committee, in which suggested standards for worm gear nomenclature were proposed.

To provide a series of flat-head clevis pins for use in various aircraft standard fittings, a specification has been approved by the aircraft division with the recommendation that it be approved by the standards committee of the Society of Automotive Engineers as an S. A. E. standard.

The printed booklets on simplified practice recommendations Nos. 109–29, for refrigerator ice compartments, 110–29, soft fiber (jute) twine, and 93–29, paper shipping tags, are now available for purchase, at 10 cents per copy, from the Superintendent of Documents, Government Printing Office.

Owing to the fact that the ball hexagon bolts and nuts as covered in the present S. A. E. standard of the 1930 edition of the S. A. E. handbook, are obsolete and no longer in use, the aircraft division of the Society of Automotive Engineers has recommended the cancellation of these specifications.

A permanent committee on standardization of supplies, composed of the insular purchasing agent, the director of public works, and the director of the bureau of science, has been created in the Philippine Islands. The same officials compose the committee on motor transportation. These committees standardize only supplies and motor vehicles for Government use.

With a view to simplifying the sizes and capacities of cup-shaped ice cream containers, the simplified practice committee of the International Association of Ice Cream Manufacturers has instituted a variety survey of present practices. The final report will serve as a basis for a simplified practice recommendation for the information and guidance of all interests.

Following adoption by the Society of Automotive Engineers of the standard for round unslotted head bolts in February, 1929, it was suggested to the screw-threads division of the S. A. E. that a standard be adopted for the round unslotted-head bolt having an oval or diamond section neck under the head. It was indicated that this type of bolt is especially applicable in automobile work, particularly where the bolt goes through wood. Proposed specifications were later referred to the screw-thread division for approval, and that division has now recommended that they be adopted by the society as an S. A. E. standard.

There is a definite need for standardization of sizes of small-dimension lumber stock within the various consuming industries, F. E. Colesworthy, of the National Association of Purchasing Agents, told the annual meeting of the National Wood Utilization Committee. He further pointed out the need for knowledge by the consumer of those sizes which are standard. This statement was followed by an expression from Harry B. Krausz, that the standardization of sizes would permit the producer to operate on a balanced schedule, and thus keep his manufacturing personnel intact during the entire year.

A variety survey covering cottage cheese jars is being made jointly by the Glass Container Association of America and the International Association of Milk Dealers, to ascertain, through questionnaires mailed to all interests, those sizes of jars which satisfy the maximum demand. The final report will serve as a basis for recommendations to the entire industry. Constructive modifications and general approval of the final program will depend upon the action of a general conference of all interests and affirmative replies to a letter referendum.

The aircraft division of the Society of Automotive Engineers has recommended the inclusion of a 5-inch size of plain pulley corresponding to the one of similar size in the series of antifriction bearings. A series of antifriction bearing pulleys similar to the present series of plain-bearing nonmetallic pulleys is recommended for approval as an S. A. E. standard.

The Food Service Equipment Association, formed in April, 1930, by a group interested in supplies and equipment for hotels, restaurants, and institutions, has appointed a committee on simplification and standardization to make a study of existing variety of food service equipment. Among the items in this field that have been tentatively suggested for simplification are steam tables (size of opening), baking equipment, cooking utensils, and serving trays.

To provide uniformity in dimensions, strength, and streamline it has been considered desirable to develop a standard for streamline tie rods. A variable bend test for these rods was originally proposed for inclusion, but was held in abeyance pending the action of the forthcoming conference of the Society of Automotive Engineers. The aircraft division of the society has recommended the approval of the proposed specification on streamline tie rods as an S. A. E. standard.

A general conference on simplification of abrasive grain sizes was held at the Bureau of Standards on May 8. The recommendation, which was approved, provides for a list of standard sizes for abrasive grains. The recommendation is to become effective September 1, 1930. The conference authorized the appointment of a standing committee, to be composed of three manufacturers of abrasive grains and three users of the commodity. The duties of this committee will be to take care of revisions, to keep the recommendation abreast of the current trend in the industry. An additional committee, to be made up of two manufacturers of grains, two manufacturers of abrasives, and two users of abrasives, was also appointed to make a study during the coming year of screens and screening practices as applied to abrasive materials.

In order that the present series of spline shaft ends and hubs be completed to provide dimensions for shafts and hubs for the larger sizes of engine, it is proposed to adopt new shaft end and hub dimensions to be known as S. A. E. No. 50, which are similar to those used at present on the shaft end for geared Hornet engines. The proposed dimensions for this new size have been recommended for approval as an addition to the present S. A. E. standard on spline shaft ends and hubs by the aircraft-engine division of the Society of Automotive Engineers.

Although for some time specifications have existed providing for standard spline shaft ends and hubs, thereby making these parts interchangeable, there has been no interchangeability of cones and nuts from one size of standard shaft end to another. It has been felt for some time by various engine manufacturers that standardization of these parts would be of considerable value, and the matter was submitted to the aircraft-engine division of the Society of Automotive Engineers for consideration. As a result, a series of propeller-hub cones and nuts have been developed for the complete series of the S. A. E. spline shaft ends and hubs. The division recommended that the specifications be adopted as an S. A. E. standard.

A general conference of representative manufacturers, distributors, and users of bell bottom screw jacks, held in Chicago on May 20, unanimously approved a simplified practice recommendation covering this product. The action of this conference, which was held under the auspices of the division of simplified practice of the Bureau of Standards, will result in reducing the number of sizes of this type of jack from 78 to 38. The recommendation, subject to the approval of the industry by signed acceptance, is to be effective from October 1, 1930.

CURRENT ACTIVITIES OF THE AMERICAN STANDARDS ASSOCIATION

Standards for Domestic Refrigerators, Grand Stands, Fuel Oils, Safety Codes for Woodworking Plants, Slotted Head Proportions, Safety Code for Explosives in Coal Mines, Spindle Noses and Chucks, and Pressure and Vacuum Gauges

---

A final draft of the test code for domestic refrigerators has been prepared by a subcommittee of the A. S. A. technical committee on the standardization of domestic refrigerators, and will shortly be submitted for approval. One of the important changes from previous draft of the code involves having tests run at room temperatures of 75° instead of 80° F.

The A. S. A. has approved the joint request of the department of labor and industry of the State of Pennsylvania, the Belmont Iron Works, and the Wayne Iron Works, for the establishment of a national safety code for the construction of grand stands. The seriousness of the accident situation may be judged from the fact that one of the foremost casualty insurance companies has refused for more than 10 years to insure wooden grand stands, the most common type of temporary grand stand. The increased interest in athletics is one of the reasons given for the need for a national safety code.

The work of the A. S. A. technical committee on the standardization of fuel oil, under the sponsorship of the American Society for Testing Materials, has been started with the appointment of two subcommittees to develop specifications for domestic and industrial fuel oil and for Diesel fuel oil. The subcommittee on domestic and industrial fuel oils will review the existing Federal specification as a basis for the development of the proposed American standard. The scope of the committee's work has been defined as follows: "The preparation of specifications for fuel oil, including domestic, industrial, and Diesel fuels and excluding oils with a flash point below approximately 100° F. tag. closed cup, oil burned in wick burners, and oil for gas-making purposes."

A revision of the safety code for woodworking plants has been approved as American tentative standard by the A. S. A. The revised code permits higher limiting speeds for circular saws than were permitted in the previous edition of the code. The higher speeds are made possible by the use of alloy steels. The standard was prepared and revised under the sponsorship of the International Association of Industrial Accident Boards and Commissions, and the National Bureau of Casualty and Surety Underwriters.

The American standard for slotted-head proportions has just been approved by the American Standards Association. The standard developed under the sponsorship of the American Society of Mechanical Engineers and the Society of Automotive Engineers covers head dimensions for machine screws, cap screws, and wood screws, and gives tables of the types of head and length of each size regularly carried in stock.

Approval of the code for the use of explosives in bituminous coal mines as American recommended practice, has been given by the A. S. A. The code was developed under the sponsorship of the Mine Inspectors Institute, and includes sections on (1) suitability of types of explosives and appliances for use in bituminous coal mines; (2) handling and storing explosives on surface; (3) transportation, handling, and storage underground; and (4) methods and precautions for charging and firing, including inspection. Hundreds of fatalities result annually from the improper handling and use of explosives in mining and it is believed that the widespread adoption of this code will materially decrease the number of such fatalities

---

Drafts of the proposed American standards for spindle noses and for chucks have been prepared by subcommittees of the A. S. A. technical committee on the standardization of small tools and machine tool elements, and are available for review through the A. S. A. office. The drafts include 29 prints showing the dimensions of the proposed spindle noses and chucks. The committees propose "that there be three types of each size of spindle nose, and that all standard chucks for a given size of spindle nose be interchangeable on each of the three types. This will allow a wider use of chucks made in accordance with the proposed standards."

The establishment of a national standard for pressure and vacuum gauges was requested by a general conference of manufacturers and users of such gauges, held under the auspices of the A. S. A. on May 15. The conference was held at the request of the American Society of Mechanical Engineers, which wished to learn whether industry generally favored national standardization in this field. If the action of the conference is approved by the A. S. A., the preparation of the standard will be undertaken by a technical committee in the near future.

Specifications for pressure and vacuum gauges have been developed by a number of organizations, including the United States Navy Department. One of the functions of the technical committee will be to correlate existing specifications in the development of a national standard. Accuracy for pressure and vacuum gauges is needed not only for more certain control of industrial processes but also to insure safety of life and property. For example, a gauge may indicate zero pressure while there is still sufficient pressure to constitute a serious hazard if a boiler or tank is opened. Pressure and vacuum gauges are important to almost every industry in some phase of its operation. Some of the industries to which they are of special concern are rubber, chemical, automobile, railways, oil and compressed gas, power plants, and farm machinery.

THE COMMERCIAL STANDARDS SERVICE AND ITS VALUE TO BUSINESS

New Booklet of Bureau of Standards Sets Forth Functions of Division of Trade Standards

A 34-page booklet, bearing the above title and designated CSO–30 has recently been received from the Government Printer and is now available for distribution by the division of trade standards.

This publication describes the services which are available on request to industry through the division of trade standards, and, in addition, covers many other interesting aspects of the standardization movement; among which are chapters on the background and origin of commercial standards and their necessity, scope, purpose, and application.

Fourteen examples of commercial standards are briefly described, supplemented by the benefits and economies which may be effected through the establishment of well-known standards as common denominators for every-day trade.

For those who prefer the question and answer style for a quick grasp of the main features of commercial standards, a classified set of 33 brief questions and pithy answers covering the most important elements, should prove useful.

The pamphlet describes briefly the evolution and definition of standards with particular emphasis on the value of voluntary standards. Under the heading "Economic necessity" the booklet states: Any analysis of our economic situation is bound to reveal certain facts and obvious trends in the commerce of 1930. With increased leisure our people are devoting more time and attention to careful and judicious expenditure. There is more shopping around for greater values and better bargains, not only among the women who buy for the individual family, but among the professional purchasing agents who contract for the materials used and fabricated by our large industrial organizations and institutions. With greater purchasing power, increased travel, and speedier means of communication our people are demanding higher quality and are looking for some dependable guide to aid their judgment. Every known article possessing outstanding or unusual quality is enjoying a large demand.

In the present perplexing market of novelties and color the consumer buyers, and even the professional purchasing agents are reporting it increasingly difficult to distinguish between items of real merit and inferior products built for appearance only. It is natural, therefore, that the consumer buyer and the purchasing agent are both seeking authoritative and dependable criteria of quality, and are welcoming certificates from reputable producers that the quality of the goods equals or exceeds the commercial standard specification.

Among the producers, competition was never keener. In the ever widening arena of strife for a share of the consumer's dollar, companies are merging and individual producers are forming associations to wage the contest of industry against industry as being more significant than the private battle of producer against producer. The alert trade association seeks a means of assuring purchasers of the inherent quality of the proffered goods. Individual trade-marks and trade association labels are helpful, but frequently are not sufficient to satisfy the skepticism of the modern purchaser who demands to be shown, with laboratory analyses and methods of test, the quality of goods delivered. In general, it may be said that the producers are experts in their own commodity field, but seldom is the consumer given the full benefit of this knowledge. Usually the producers as a group could, if they would, inform the consumer as to the grade or quality best suited to his needs with far greater accuracy and confidence than the consumer could possibly muster from any other source. Under present conditions this group knowledge is suppressed and the tendency is all too frequent to give the buyer merely what he asks for.

The "Fundamental purpose" is depicted as follows:

> The chief purpose of the work is to catch and to hold from present or future retrogression commercial progress toward ideals of commodity quality and performance by encouraging the voluntary establishment of commercial standards as a basis for marketing. It is unthinkable that the consumer will willingly relinquish nationally recognized means and methods of checking the quality and value of the goods he buys. Therefore, it is hoped that the commercial standard will act as a ratchet in the advance of sound merchandising methods.

FOUNDRY PATTERNS OF WOOD

Commercial Standard for Color Markings Now in Printed Form

A pamphlet entitled "Foundry Patterns of Wood," Commercial Standard CS19–30, has been released for distribution. It covers the color markings recommended as standard by the producers and users for foundry patterns and core boxes of wood construction in order that there may be no misunderstanding as regards the intention of the pattern maker.

(*a*) Surfaces to be left unfinished are to be painted black.

(*b*) Surfaces to be machined are to be painted red.

(*c*) Seats of and for loose pieces are to be marked by red stripes on a yellow background.

(*d*) Core prints and seats for loose core prints are to be painted yellow.

(*e*) Stop-offs are to be indicated by diagonal black stripes on a yellow base.

Some variations in shades of above colors are permissible within reasonable limitations. The colors may be obtained by mixing suitable inexpensive pigments with varnish or shellac to produce the type of coating desired.

The commercial standard became effective for new production February 10, 1930. Copies of the pamphlet may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10 cents per copy.

PROPOSED STANDARDIZATION OF COLORS FOR SANITARY WARE

Industry Has Requested Cooperation of the Bureau of Standards in Promulgation of Commercial Standard

Recent trends of the times indicate a growing appreciation and use of color in interior decoration even in the bathroom and kitchen. It has brought opportunities for the plumber, architect, and interior decorator, and it has also brought problems to the manufacturers of colored sanitary ware.

There are three kinds of sanitary ware—vitreous china, porcelain (all-clay), and enameled iron. The probability of difference in shade arises when one manufacturer supplies the vitreous china lavatory and another supplies the enameled bath. This fact is forcibly emphasized in a display of available color samples assembled by the National Bureau of Standards, where 104 different shades are shown. Very often after fixtures are set, because of this wide diversity of colors, and lack of color harmony, they are rejected by the owner at a considerable expense to the contractor, wholesaler, and manufacturer. As a result of this rather chaotic condition the division of trade standards, Bureau of Standards, received a request to cooperate with an advisory committee of the manufacturers in attempting a solution of some of their problems.

Requirements of standardization.

A solution of these problems involves much more than the elimination of many existing shades of color. The following points are necessary in the successful coordination of individual color ranges in vitreous china, enameled sanitary ware, and allied products:

The colors must be (1) desirable, (2) economically produced, (3) easily reproduced, and (4) suitable to enameled cast iron, vitreous china, porcelain, wood seats, etc.

In the standardization of colors for sanitary ware it should be borne in mind that an absolute match of shades is neither possible nor necessary, but the shades should as nearly match as the differences in the character of materials, lighting conditions, and manufacturing processes permit.

Proposed standard colors.

In a survey of colors used in the production of sanitary ware, green was found to be the most popular color with orchid a close second. Blue was third, while ivory, light brown or buff, and black were about equal in popularity. As a result of this survey these six colors were selected by the advisory committee of manufacturers of sanitary ware as recommended standard colors for sanitary ware, and given the following designations:

SC10, green.	SC40, blue.
SC20, orchid.	SC40, light brown or buff.
SC30, ivory.	SC60, black.

Other recommendations of the committee.

It is the recommendation of the committee that all colored ware be considered as special rather than regular, since the trouble involved and the time lost in preparation results in increased cost of production. The development of individual colors for special pieces, for instance, drinking fountains, and the matching of colors for special work will not come within the scope of standardization of colors for sanitary ware.

The elimination of secrecy in connection with the production of color in the glazes and enamels is suggested by the advisory committee. A thorough understanding among the manufacturers that there is no need for secrecy in such matters would materially benefit the trade. With this idea in mind the committee has filed with the division of trade standards the formulas, firing temperatures, and other information needed to produce the standard colors as selected by the committee.

The distribution of the standard colors is to be under the supervision of the Bureau of Standards. A general conference to be held in the near future will afford an opportunity for producers, distributors, and users to comment on the proposed standard colors for sanitary ware.

NEW MATERIAL CALLED MAIZOLITH MADE FROM CORNSTALKS

Bureau of Standards Finds Maizolith Valuable as Electrical Insulator and for Other Industrial Purposes

A new material has recently been made from cornstalks and corncobs by the National Bureau of Standards and Iowa State College in their experimental plant at Ames, Iowa. This material has properties which may make it of value in various industries. The new material, which has been named maizolith (pronounced maze-o-lith) ranges in color from tan to a deep ebony. It machines readily, and may be given a high polish. Tests on maizolith show that it has a volume resistivity of 3,000,000,000 ohms per cubic centimeter, a tensile strength of about 7,000 pounds per square inch, and a compressive strength of about 17,000 pounds per square inch.

In addition to use in electrical insulating work, maizolith might be employed to make the following articles: Noiseless gears, bushings, washers, refillable fuses, rings, disks, handles, knobs, levers, pinions, wheels, castors, rollers, and bearings.

The process used in making the new material is a comparatively simple one. Cornstalks or corncobs are first reduced to fairly small pieces in a shredding machine. The shredded particles are cooked with a solution of caustic soda. The pulp is then washed and beaten to a jell in a paper mill beating engine and Jordan refiner. The jell is boiled to remove air bubbles, placed in a mold, and allowed to dry at about 158° F. On drying, the jell shrinks to about one-fourth its original size and becomes the hard, dense material previously described. Details of the process of manufacture will be found in Bureau of Standards Miscellaneous Publication 108, obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., at a price of 5 cents each.

SAFETY CODE FOR AUTOMOBILE BRAKES

American Standard Safety Code for Automobile Brakes Issued in Printed Form by National Bureau of Standards

Miscellaneous publication No. 107, which has just been issued by the National Bureau of Standards, contains the safety code for automobile brakes and brake testing, recently approved as an American standard by the American Standards Association. The essential requirements for performance of all passenger-carrying motor vehicles of whatever weight, and for all other motor vehicles of less than 6,000 pounds gross weight, are given as follows:

On a dry, hard, level road, free from loose material, the foot brake shall be capable of stopping the vehicle from a speed of 20 miles per hour within a distance of 50 feet, or at a rate which corresponds to such performance. Under these conditions the hand brake shall be capable of stopping the vehicle within 75 feet.

For the 2-year period following the adoption of the code, motor trucks (as defined in the code) weighing more than 6,000 pounds gross, operating either singly of in combination, shall be capable of stopping (under the same conditions as previously expressed) within a distance of 50 feet upon application of both foot and hand brake, and within a distance of 75 feet upon the application of either the foot or hand brake. Subsequent to the 2-year period following the adoption of the code the requirements for all vehicles shall be the same as required above for passenger-carrying vehicles.

The code prescribes that the method of testing shall be by the use of instruments suitable for the purpose which shall be approved after examination by an unprejudiced engineering authority of recognized standing. In matters of dispute concerning either the method of test or testing instruments, the National Bureau of Standards will act as referee when called upon to do so.

Introduction of 4-wheel brakes.

Following the introduction of 4-wheel brakes into this country, the interest in automobile brakes was greatly increased. Before this time comparatively little attention was paid to legislation on the subject, and requirements were generally expressed in such indefinite terms as "the brakes shall be good and sufficient." The usual thing for Americans to do in such a case, where a deficiency is realized, is to propose that "there should be a law about it." That was the reaction in this instance, and it looked as though much ill-advised or hastily considered legislation might be enacted. This was particularly likely because of the lack of experimental data on which to base such legislation.

Such was the situation in late 1923 when the Bureau of Standards and the American Automobile Association jointly sponsored the organization of a committee, formed from representative organizations throughout the country, to study the problem. Road tests were made of all manner of motor vehicles, trucks, busses, and pleasure vehicles, in order to determine how quickly they could stop. Various cities were visited during the tests, including New York, Philadelphia, and Baltimore, in addition to Washington. A large number of motor trucks were tested in the vicinity of Cincinnati, Ohio.

The average performance of brakes did not differ greatly for the various cities, nor did the average performance in any of the cities differ greatly from that of a large number of tests furnished the experimenters by the authorities of the State of Massachusetts.

The result of the work of the committee is the present code which has been approved by the American Standards Association, under whose auspices the committee was constituted. Copies of this publication may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents each.

STANDARD PAPER SIZES HAVE BEEN ADOPTED ABROAD

Standard Paper Sizes Adopted by 13 Countries, of Which 12 Use the Metric System

During the year 1929 European printers and paper makers have made progress toward standardization of paper, as regards sizes and quality. Less progress has been made in England than as on the Continent, where the standardization of paper sizes occupies a great deal of attention.

A questionnaire issued by the German standards committee indicated that in 13 out of 20 countries circularized standard paper sizes have been introduced; of these 13 countries, 12 have adopted a metric system of simple progressive sizes. The committee is engaged in formulating standards for the size of letter sheets, printing forms for commercial letters, envelopes, and window envelopes; also catalogue sizes.

In Great Britain a certain amount of standardization has been carried out by the federation of master printers, which has adopted a definite nomenclature, with 11 sizes of writing papers and 8 for printing papers. The sizes of paper and envelopes used by His Majesty's Stationery Office have been fixed, and the Post Office is working as closely as possible to the continental system adopted by the Postal Union Congress. But there is no general standardization yet, and the paper maker supplies his customer with any size desired. Standards of durability have also advanced, particularly as a result of the work of the Library Association, and a series of standard grades is likely to appear soon. (R. J. Politzer in The Inland Printer for May.)

PROGRESS IN THE INTRODUCTION OF AMERICAN LUMBER STANDARDS

Central and Consulting Committees on Lumber Standards Review Progress in Standardization and Grade Marking

The central committee on lumber standards closed its Chicago meeting of April 22 with expressions of satisfaction and gratification on the remarkable progress being made in the manufacture, distribution, specification, and use of American standard lumber, which also bears the trade and grade marks of the National Lumber Manufacturers' Association. In carload shipments it is identified by properly executed car tally cards.

Commenting on the fact that sound practical national standards for softwood lumber are now completed and have recently been published by the Department of Commerce, W. E. Hawley, presiding at the conference, complimented the lumber industry "on its continued interest in standardization of its products, and its desire better to serve the consuming public by offering a standardized product and its many savings and accompanying benefits." He further stated that "the decision to continue this organization of the lumber trade demonstrates the willingness of the industry to maintain the interest and benefits of lumber standardization inaugurated with the encouragement of President Hoover, when Secretary of Commerce, more than eight years ago."

Among the other important subjects acted upon by practically the full membership of the central committee on lumber standards and the consulting committee were moldings and the moisture content specifications which is now a part of the grading specifications of the Southern Pine Association.

Lumber seasoning.

In accordance with the provisions of the American lumber standards, that manufacturers' associations shall develop lumber-seasoning and moisture-content specifications, in accordance with their own conditions and the requirements of the users of their products, the Southern Pine Association filed for the approval of the central committee the moisture-content specifications incorporated in the current edition of its grading rules for yard lumber. The central and consulting committees approved the specifications as in accordance with the above-mentioned provisions of the standards.

Commercial standards.

The advisability of designating the present American lumber standards as "commercial standards" instead of a "simplified practice recommendation" was thoroughly discussed by the joint meeting. The meeting was of the opinion that no change should be made that would in any way effect the continued use of the term, "American lumber standards." It not only has become well established in the trade, but also has merchandizing value. Primarily, for this reason, the meeting deemed it inadvisable to redesignate the simplified practice recommendation as a commercial standard at this time, though it did suggest that this subject be given further thought.

Furtherance of standardization.

In a report of the present status of application of the provisions of the American lumber standards, the secretary of the committee advised that now fully 90 per cent of all softwood lumber produced and graded under the rules of the recognized softwood lumber manufacturers associations was American standard lumber. In the grade, trade, or species marking of lumber manufacturers associations have made rapid progress in the past several years. Each recognized association of softwood manufacturers has now adopted as association policy, which members thereof have put into practice, grade-marked lumber, estimated at 8,000,000,000 feet in softwoods, including considerable hardwood lumber, available annually. It involves every species and item of yard lumber, including hardwood flooring, softwood factory, and shop lumber, softwood structural material, shingles, and lath.

The closest approach to the adoption of a brand or insignia denoting American standard lumber is that adopted by the National Lumber Manufacturers Association, consisting of a tree-mark which, when used in conjunction with marks denoting the grade and degree of dryness, and an association trade-mark, guarantees such lumber to be American standard and to conform to such other specifications as are marked on each piece by the licensed manufacturer. Grade-marked and tree-marked lumber is also available in many species and items.

STANDARDIZATION OF AGRICULTURAL EQUIPMENT IN SWEDEN

Association to Push Standardization in Agriculture

The Swedish Technical Agricultural Association (Jordbruksteknisha Foreningen) proposes to conduct a vigorous campaign, in connection with the forthcoming agricultural convention to be held at Stockholm this year, in favor of standardization in Swedish agriculture, according to the Bulletin of the International Management Institute.

The association is to create on the exhibition ground a model farm, comprising all farm buildings completely furnished and fitted with electrical and mechanical equipment sufficient for a farm of 40 hectares (100 acres). This will afford an excellent opportunity of demonstrating the value of standardization, both by arranging a special standardization exhibition in one of the buildings and by exhibiting the standardized parts of the appliances belonging to the model farm.

PAPER BAGS AS SHIPPING CONTAINERS

Tests Show That Certain Kinds of Paper Bags Are Suitable for Shipping Purposes

Paper bags are being widely used as shipping containers, since they possess the desirable features of strength, nonsifting of contents, water and vermin resistance, and economy. The most common type is the multiple-wall bag, composed of kraft paper made water resistant by rosin sizing and having a self-closing valve through which the material is introduced. This type of bag is in extensive use for cement and other similar materials, and has proved economical not only in respect to its cost but also in respect to breakage and protection of the contents.

There is considerable interest in the possibility of extending the use of bags of this type to other materials which must be well protected from moisture. Difficulties have been experienced with substances which absorb water readily, such as quicklime and sugar. In long shipments or in storage, quicklime absorbs sufficient moisture from the air to burst the bag through the swelling of the lime. From the same cause, sugar sometimes becomes so lumpy as to have its sales value considerably decreased. On the other hand. in many chemical preparations and food products the avoidance of loss of moisture is desired. For these purposes the ordinary type of bag has proved unsatisfactory as it is not sufficiently impervious to air.

Recent tests of sheathing papers indicated that there are papers available which are sufficiently impervious to air and which have the other necessary qualifications for bag use, such as strength, flexibility, water resistance, and lack of odor. The results of tests of these papers were reported in the Bureau of Standards Journal of Research, Vol. 3, No. 1, July, 1929. (R. P. 85, price 5 cents, from the Superintendent of Documents, Government Printing Office.) Two of these papers appear to be particularly suitable. One, designated in the publication as 2 L, is made of three plies of oiled kraft paper cemented together with two layers of asphalt. The other, designated 8 L, is made of two plies of kraft paper with an inner layer of zinc foil, all cemented together with asphalt. Paper of the latter type costs about twice as much as that of the type first mentioned, but is practically impervious to air.

Other considerations of importance are strength and means of sealing the bags so as to have air-tight joints. Tests of the air-tightness of bags could be made by exposing bags filled with quicklime or other hygroscopic material to a moisture-saturated atmosphere. For testing walls and ends an impervious container filled with hygroscopic material and provided with an open end and means for fastening on a diaphragm of the material to be tested could be used.

Change of weight per unit time would give the desired measurement rapidly. Strength could be determined by the "drop test" which is commonly applied by dropping filled bags until they burst and noting the number of drops the bag withstands. There should be no difficulty in meeting all strength requirements, as papers reinforced by textile fabrics are available if required. Research along the lines indicated would no doubt result in the development of more satisfactory containers for a wide variety of materials.

ZONING LAWS IN EFFECT IN 46 STATES

Thirty Years of Steady Progress in the Development of Zoning Legislation

Municipal regulation by districts, of use, height, and area of buildings had been provided for in zoning laws passed in 46 of the States at the close of the 1929 legislative session. In addition, the State of Washington permits cities of the first class to zone under their home-rule charters, and a special enactment of the Vermont Legislature permits zoning in one municipality. In several of the States the county and township governing bodies also are empowered to enact such legislation.

The development of zoning legislation in the United States has occurred within a period of 30 years, and the most rapid development has occurred since 1923, in which year a standard State zoning enabling act was prepared by the advisory committee on city planning and zoning and issued as Bureau of Standards publication BH5. The recommendations set forth in this publication have been used in whole or large part by the legislatures of 35 States in the enactment of 54 zoning laws.

Copies of the mimeographed report may be obtained by writing to the division of building and housing, Bureau of Standards, while copies of the standard State zoning enabling act may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents each.

INTERNATIONAL COOPERATION ON STANDARDS FOR PETROLEUM PRODUCTS

Arrangements have recently been completed whereby the American Society for Testing Materials enters into formal cooperative relations with the German Society for Testing Materials, in the consideration of methods of tests for petroleum products and lubricants. Exchange of minutes, reports, and similar papers has already begun, and discussions are taking place relative to the conversion of viscosities measured with different instruments.

With respect to viscosity tests cooperative work is being planned between the National Bureau of Standards, the National Physical Laboratory of Great Britain, and the Physikalisch-Technische Reichsanstalt of Germany, in the determination of absolute and kinematic viscosities, through interchange of samples and comparison of test results.

SCIENTIFIC, TECHNICAL, AND COMMERCIAL PERIODICAL PUBLICATIONS ISSUED BY THE NATIONAL BUREAU OF STANDARDS

BUREAU OF STANDARDS JOURNAL OF RESEARCH

The new Journal describes the bureau's research results in science and technology. The union of science and its applications in one journal shortens the lag between discovery and application.

All engaged in industry and commerce should have available for current use and permanent reference, the Bureau of Standards Journal of Research.

Early in its first year the Journal developed a list of paid subscribers double the anticipated maximum.

This Journal is full of interest to executives and technicians controlling industries and commercial enterprises. It enables them better to promote efficiency by determining the scientific measured controls of process through experimental and theoretical research.

Issued monthly
Subscription price, $2.75 per year

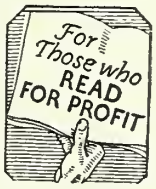
TECHNICAL NEWS BULLETIN

The Bureau of Standards periodical with a WAR RECORD! Started during the dark days of 1917 to keep the Army and Navy and other branches of the Government informed of progress in scientific war research at the bureau. Upon urgent request this publication was continued and expanded to serve the Government, science, and industry.

The TECHNICAL NEWS BULLETIN will keep you informed of current progress in the scientific and technical work of the bureau's laboratories, and gives each month a list of the publications of the bureau. A complete cross index is published with the December issue.

You can not afford to be without the TECHNICAL NEWS BULLETIN. Every article is short and to the point. The busiest executive can afford the time to read it.

Issued monthly
Subscription price, 25 cents per year



COMMERCIAL STANDARDS MONTHLY

This new governmental periodical is a review of progress in commercial simplification and standardization. It is the only journal of its kind. It covers the national movement initiated by President Hoover for the reduction of needless sizes and varieties of products and the promotion of voluntary commercial standardization by industry.

The Secretary of Commerce in the first issue of this new journal said: "Certain standards, such as those used for weights and measures, * * * have been fixed by legislative enactment. Mandatory standards of this character, however, are few in number when compared with the large and steadily growing volume of standards developed by industry and commerce and voluntarily maintained. * * * The activities of the Commercial Standardization Group of the Bureau of Standards are concerned with standards adopted by voluntary agreement."

Subscription price, $1 per year

STANDARDS YEARBOOK FOR 1930

The new Standards Yearbook for 1930 is the fourth annual issue of a publication devoted to the great and growing field of standardization in its broad aspects. It gives a summary of progress.

Standardization is a world-wide movement. It covers all industries. It is part of the application of scientific methods to industry. Its achievements are of interest and concern to business men and manufacturers as well as to engineers. To the technician it is full of example of methods and results of suggestive and stimulating value. To business men it discloses trends which deeply concern their interest.

NOW READY Price, 75c. ORDER AT ONCE

"Standardization is becoming an aspect of all well-ordered activity rather than an incidental activity supplemental to others."

To obtain regularly the above-described monthly periodicals send your order, with remittance, addressed: Superintendent of Documents, Government Printing Office, Washington, D. C. Foreign prices (countries other than the United States and its possessions, Canada, Mexico, Newfoundland, Cuba, and Republic of Panama) are: Journal, $3.75; Bulletin, $0.40; Monthly, $1.25; Yearbook, $0.90

"* * * this department * * * is devoted solely to aiding and fostering the development of higher standards of living and comfort of our people * * * its ideals are clear: That by cooperation and not by compulsion it should seek to assist in maintaining and giving the impulse of progress to commerce and industry in a nation whose successful economic life underlies advancement in every other field."

—President Hoover, at the laying of the corner stone of the new building of the U. S. Department of Commerce, June 10, 1929.

THE UNITED STATES DEPARTMENT OF COMMERCE

R. P. LAMONT, Secretary of Commerce

AERONAUTICS BRANCH, Clarence M. Young, Assistant Secretary of Commerce for Aeronautics.

Establishment of civil airways and maintenance of aids to air navigation; inspection and registration of aircraft and licensing of pilots; enforcement of air traffic rules; investigation of accidents; encouragement of municipal air ports; fostering of air commerce; scientific research in aeronautics; and dissemination of information relating to commercial aeronautics. (Some of these functions are performed by special divisions of the Lighthouse Service, the Bureau of Standards, and the Coast and Geodetic Survey.)

BUREAU OF THE CENSUS, William M. Steuart, Director.

Taking censuses of population, mines and quarries, water transportation, and religious bodies every 10 years; censuses of agriculture and electrical public utilities every 5 years; and a census of manufactures every 2 years. Compilation of statistics of wealth, public debt and taxation, including financial statistics of local governments, every 10 years; annual compilation of financial statistics of State and municipal governments

Compilation of statistics of marriage, divorce, births, deaths, and penal and other institutions annually, and of death rates in cities and automobile accidents weekly.

Compilation quarterly or monthly of statistics on cotton, wool, leather, and other industries; annually of forest products; and publication monthly of Survey of Current Business.

BUREAU OF FOREIGN AND DOMESTIC COMMERCE, William L. Cooper, Director.

The collection of timely information concerning world market conditions and openings for American products in foreign countries, through commercial attachés, trade commissioners, and consular officers, and its distribution through weekly Commerce Reports, bulletins, confidential circulars, the news and trade press, and district and cooperative offices in 65 cities. The maintenance of commodity, technical, and regional divisions to afford special service to American exporters and manufacturers.

The compilation and distribution of lists of possible buyers and agents for American products in all parts of the world and publication of weekly lists of specific sales opportunities abroad.

The publicity of statistics on imports and exports.

The study of the processes of domestic trade and commerce.

BUREAU OF STANDARDS, George K. Burgess, Director.

Custody, development, and construction of standards of measurement, quality, performance, or practice; comparison of standards used by scientific or other institutions; determination of physical constants and properties of materials; researches and tests on materials and processes; and publication of scientific and technical bulletins reporting results of researches and fundamental technical data.

Collection and dissemination of information concerning building codes and the planning and construction of houses.

Establishment of simplified commercial practices through cooperation with business organizations in order to reduce the wastes resulting from excessive variety in commodities.

BUREAU OF MINES, Scott Turner, Director.

Technical investigations in the mining, preparation, and utilization of minerals, including the study of mine hazards and safety methods and of improved methods in the production and use of minerals.

Testing of Government fuels and management of the Government Fuel Yard at Washington.

Research on helium and operation of plants producing it.

BUREAU OF MINES—Continued.

Studies in the economics and marketing of minerals and collection of statistics on mineral resources and mine accidents.

The dissemination of results of technical and economic researches in bulletins, technical papers, mineral resources series, miners' circulars, and miscellaneous publications.

BUREAU OF FISHERIES, Henry O'Malley, Commissioner

The propagation and distribution of food fish and shellfish, in order to prevent the depletion of the fisheries; investigations to promote conservation of fishery resources; the development of commercial fisheries and agriculture; study of fishery methods, improvements in merchandising, and collection of fishery statistics; administration of Alaska fisheries and fur seals; and the protection of sponges off the coast of Florida.

BUREAU OF LIGHTHOUSES, George R. Putnam, Commissioner.

Maintenance of lighthouses and other aids to water navigation. Establishment and maintenance of aids to navigation along civil airways. Publication of Light Lists, Buoy Lists, and Notices to Mariners.

COAST AND GEODETIC SURVEY, R. S. Patton, Director

Survey of the coasts of the United States and publication of charts for the navigation of the adjacent waters, including Alaska, the Philippine Islands, Hawaii, Porto Rico, the Virgin Islands, and the Canal Zone; interior control surveys; magnetic surveys; tide and current observations; and seismological investigations. Publication of results through charts, coast pilots, tide tables, current tables, and special publications.

BUREAU OF NAVIGATION, Arthur J. Tyrer, Commissioner.

Superintendence of commercial marine and merchant seamen.

Supervision of registering, enrolling, licensing, numbering, etc., of vessels under the United States flag, and the annual publication of a list of such vessels.

Enforcement of the navigation and steamboat inspection laws, including imposition of fees, fines, tonnage taxes, etc.

STEAMBOAT INSPECTION SERVICE, Dickerson N. Hoover, Supervising Inspector General.

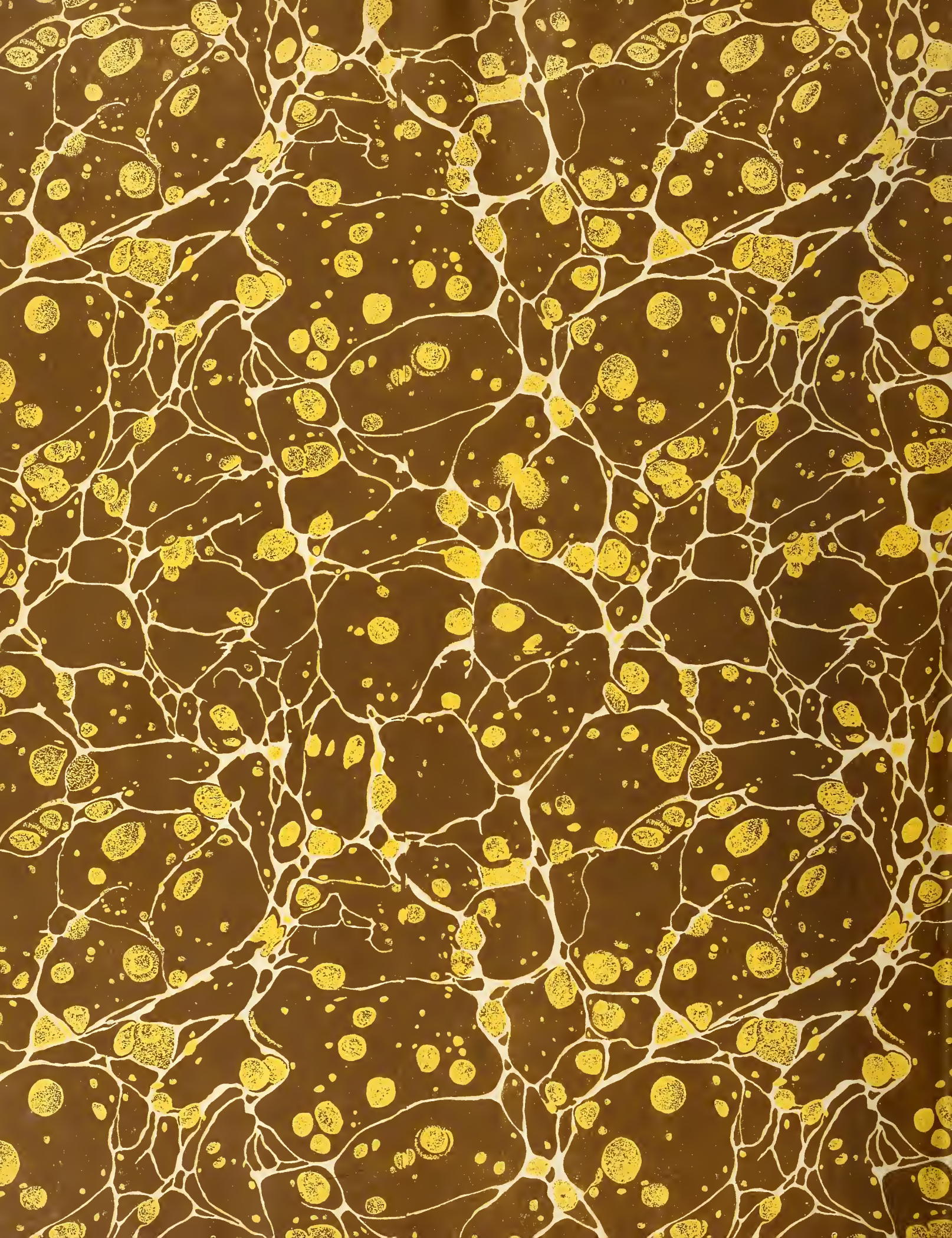
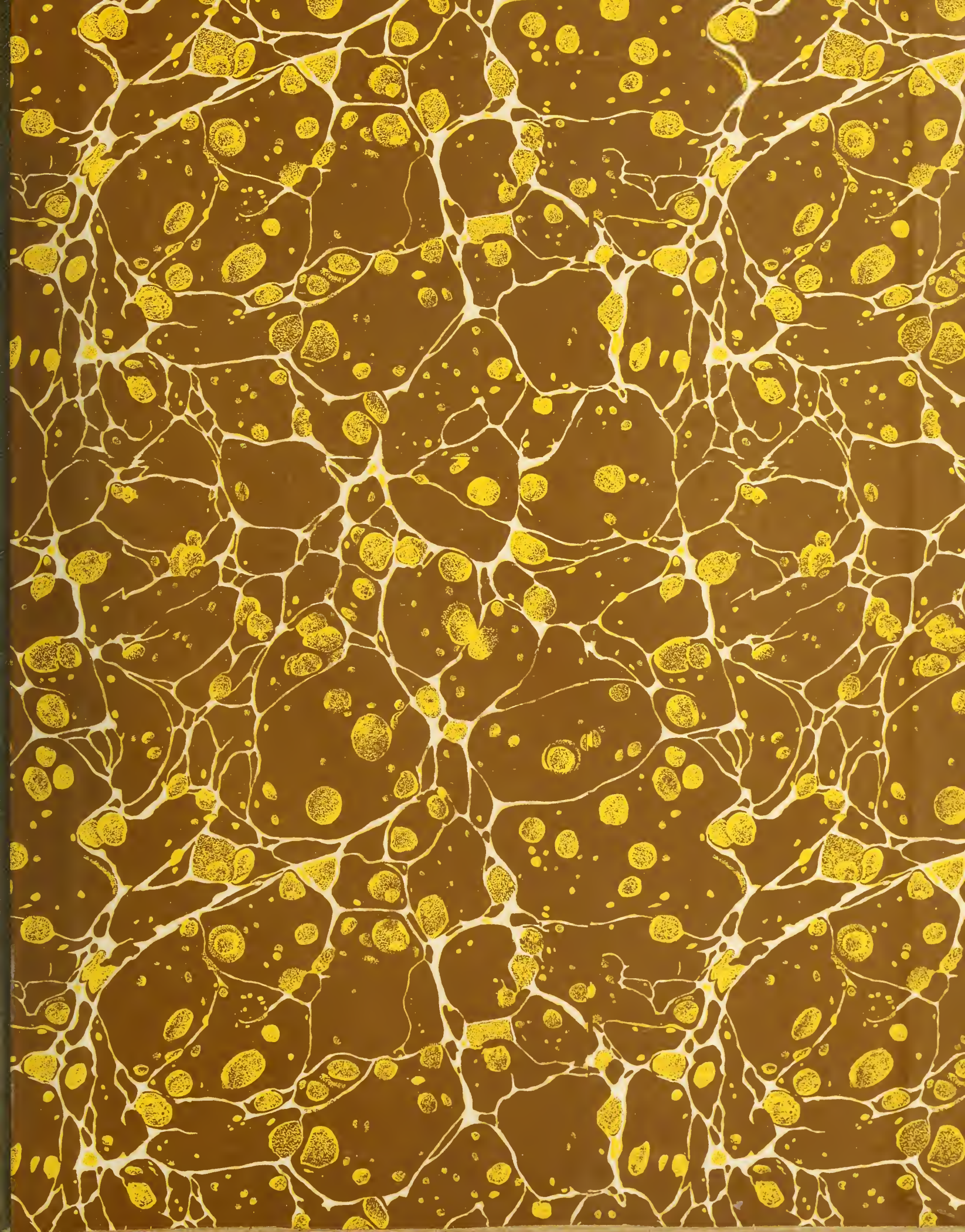
The inspection of merchant vessels, including boilers, hulls, and life-saving equipment, licensing of officers of vessels, certification of able seamen and lifeboat men, and the investigation of violations of steamboat inspection laws.

UNITED STATES PATENT OFFICE, Thomas E. Robertson, Commissioner.

The granting of patents and the registration of trade-marks, prints, and labels after technical examination and judicial proceedings.

Maintenance of library with public search room, containing copies of foreign and United States patents and trade-marks. Recording bills of sale, assignments, etc., relating to patents and trade-marks. Furnishing copies of records pertaining to patents. Publication of the weekly Official Gazette, showing the patents and trade-marks issued.

RADIO DIVISION, W. D. Terrell, Chief.

Inspection of radio stations on ships; inspection of radio stations on shore, including broadcasting stations; licensing radio operators; assigning station call letters; enforcing the terms of the International Radiotelegraphic Convention; and examining and settling international radio accounts.

U. S. GOVERNMENT PRINTING OFFICE: 1930